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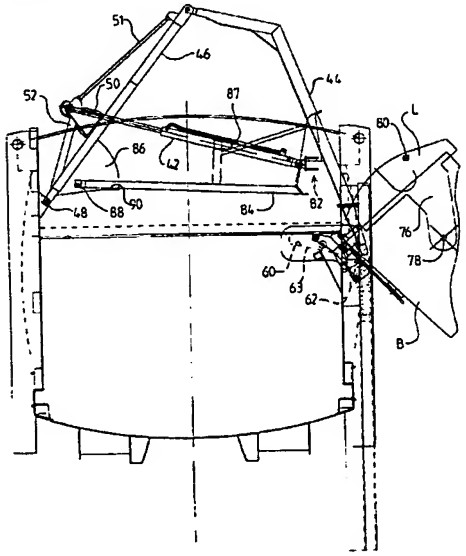
(54) Collection vehicle.

(57) A collection vehicle comprising a body (10) defining a chamber for receiving the material collected and an opening (11) adjacent to a top of the body and communicating with the chamber, running wheels, an engine for driving at least some of the running wheels, a cab for accommodating a driver and at least one hoist (7) mounted on the body at one side of the body, wherein the or each hoist is capable of operation to raise from the ground beside the vehicle a bin (B) and to tip the bin in or over the opening to discharge contents of the bin into the vehicle body, the hoist comprising a bin carrier (14), holding means for holding the bin on the carrier, a support for the bin carrier, a connecting means connecting the bin carrier with the support for tipping of the carrier relative to the support, tipping means for tipping the bin carrier relative to the support, a guide means for guiding the support for upwards and downwards movement relative to the body, and lifting means for raising the support and lowering the support along the guide means.

FIG 4



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The present invention relates to a collection vehicle comprising a body defining a chamber for receiving the material collected and a hoist, which is capable of operation to raise from the ground a bin and to tip the bin in or over an opening of the vehicle body to discharge contents of the bin into the body.

The hoist is commonly provided at the rear of a collection vehicle. When a vehicle having a hoist at the rear of the vehicle body is used for the collection of refuse from individual dwellings, it is necessary for the bins to be brought from the dwellings to the rear of the vehicle. Whilst the occupant of each dwelling can be expected to move the bin from the dwelling to the edge of his property adjacent to the street, it is necessary for operators of the vehicle to move the bins from that position into the roadway and up to the hoists on the vehicle. It is also necessary for the operators to return the bins from the roadway to or adjacent to the property which comprises the dwelling, in order that the bins will not obstruct the roadway. Similar considerations can also apply in connection with trade waste.

According to the present invention, there is provided a collection vehicle comprising a body defining a chamber for receiving the material collected and an opening adjacent to a top of the body and communicating with the chamber, running wheels, an engine for driving at least some of the running wheels, a cab for accommodating a driver and a hoist mounted on the body at one side of the body, wherein the hoist is capable of operation to raise from the ground beside the vehicle a bin and to tip the bin in or over the opening to discharge contents of the bin into the vehicle body, the hoist comprising a bin carrier, holding means for holding the bin on the carrier, a support for the bin carrier, a connecting means connecting the bin carrier with the support for tipping of the carrier relative to the support, tipping means for tipping the bin carrier relative to the support, a guide means for guiding the support for upwards and downwards movement relative to the body, and lifting means for raising the support and lowering the support along the guide means.

An example of a vehicle embodying the invention will now be described, with reference to the accompanying drawings, wherein:

FIGURE 1 is a fragmentary side elevation showing the hoist and adjacent parts of a vehicle embodying the invention;

FIGURE 2 is a plan view of certain parts represented in Figure 1;

FIGURE 3 shows a partial cross section through a body of the vehicle, together with a hoist, the cross section being in a plane which is perpendicular to the direction of travel of the vehicle, and showing the hoist in a lowered position;

FIGURE 4 is a view similar to that of Figure 3 but showing the hoist in an intermediate position;

FIGURE 5 is a view similar to that of Figure 3 but showing the hoist in a fully tipped position;

FIGURE 6 is a fragmentary view of part of Figure 3 to an enlarged scale;

FIGURE 7 is a fragmentary view of part of Figure 5 to an enlarged scale;

FIGURE 8 shows a partial cross section through a body of a vehicle, together with a second embodiment of hoist, the cross section being in a plane which is perpendicular to the direction of travel of the vehicle;

FIGURE 9 shows the hoists and adjacent parts of the vehicle, as viewed in the direction of the arrow 2 of Figure 8;

FIGURE 10 is a plan view of certain parts represented in Figure 9;

FIGURE 11 is a fragmentary side elevation of a hoist and adjacent parts of a vehicle embodying a third embodiment of the invention;

FIGURE 12 is a plan view of certain parts represented in Figure 11;

FIGURE 13 shows a partial cross section through a body of the vehicle together with the hoist shown in Figure 11, the cross-section being in a plane which is perpendicular to the direction of travel of the vehicle and showing the hoist in a lowered position;

FIGURE 14 is a view similar of that of Figure 10 but showing the hoist in an intermediate position;

FIGURE 15 is a view similar to that of Figure 13 showing the hoist in a fully tipped position;

FIGURE 16 shows the vehicle and hoists of Figure 11 in the same position as shown in Figure 15 but engaged with a smaller size of bin;

FIGURE 17 is a fragmentary view of part of Figure 11 drawn to an enlarged scale;

FIGURE 18 is a fragmentary view of part of Figure 13 drawn to an enlarged scale;

FIGURE 19 is a fragmentary view of part of Figure 15 drawn to an enlarged scale;

FIGURE 20 is a diagrammatic side view of a collection vehicle embodying the invention;

FIGURE 21 is a fragmentary plan view of part of Figure 20 showing a compressing means;

FIGURE 22 is a hydraulic circuit diagram of the third embodiment;

FIGURE 23 shows an auto actuator of the third embodiment, and

FIGURE 24 shows a safety device of the third embodiment.

A collection vehicle is shown generally at 1 in Figures 20 and 21 and comprises a known chassis provided with running wheels 2, an engine 3 for driving some of the running wheels and a cab 4 adjacent to a front of the vehicle for accommodating a driver. These parts of the vehicle may be arranged and constructed in a known manner. On the chassis, there is mounted a hollow body 10 defining a chamber for re-

ceiving material which is to be collected in the vehicle. At the top of the body and near to a vehicle cab, there is an opening 11 which communicates with the chamber inside the body. As in known vehicles, the opening 11 may lead to a hopper from which material can be moved intermittently into the chamber. There is provided a ram 5 for compacting material in the chamber and a rear end wall 6 of the chamber is arranged as a door to permit discharge of material from the chamber at the rear end thereof. A hoist means 7 is provided at one side 8 of the body 10 to hoist a bin from the ground and tip the contents of the bin into the opening 11.

In Figures 20 and 21 the hoist means 7 illustrated comprises a first embodiment described with reference to Figures 1 to 6 and in this embodiment the hoist means 7 comprises a hoist 12 mounted on the body 10 at one side of the body and near to the cab. The hoist 12 is capable of operation to raise from the ground a bin B and tip the bin over or in the opening 11 to discharge contents of the bin into the space defined by the body 10.

The hoist 12 comprises a bin carrier 14 having holding means for holding a bin on the carrier. The particular example of carrier illustrated in the accompanying drawings has holding means 16 suitable for holding a bin which has an outwardly protruding lip 18 at a top of the bin. The holding means comprises upper and lower clamping members 20, 22, see Figures 1 and 7, which can be moved apart to receive the lip 18 between them and subsequently moved towards each other to clamp the lip or to trap the lip, as hereinafter to be described. In addition, the bin carrier 14 is provided with a plurality of suction cups 24 carried on a support 25 which is resiliently mounted on the bin carrier 14 so that the cups can conform to the bin. The control means of the apparatus causes a vaccuum to be applied to the cups 24 as the bin is being lifted, as hereinafter to be described, so as to facilitate holding the bin to the carrier. Additional or alternative holding means may be provided for holding different bins on the bin carrier.

The hoist further comprises a support 26 for the bin carrier. The support is arranged for reciprocation along a vertical path relative to the body 10 between a lower position, shown in Figure 3, in which the support lies generally below the level of the body 10 and an upper position, shown in Figures 4 and 5, in which the support lies near to a top of the body. For guiding the support, there is provided a guide means 28 which is fixed with respect to the body 10. The guide means 28 comprises a pair of opposed guide members 30 which define open grooves 32, the open mouths of which face each other and which extend substantially vertically, when the vehicle stands on level ground. The support 26 has upper and lower slider portions 34 which engage and are guided by the grooves 32. The slider portions 34 may be provided with phosphor bronze shoes or other suitable bearing means.

Lifting means 40 is provided for raising the support 26 along the guide means 28 and for lowering the support down the guide means. The lifting means 40 comprises; a pair of hydraulic piston and cylinder units 42 which are mounted on the body 10 at opposite sides thereof, a pair of elongated links 44 the lower ends of which are pivotally connected with the support 26 at opposite sides thereof, and levers 46 for transmitting motion from the piston and cylinder unit 42 to an upper end portion of the links 44. The levers 46 are mounted for pivoting relative to the body 10 about a pivot axis 48 which lies near to the top of the body and near to a side of the body remote from the hoist 12. The axis 48 extends parallel to the length of the vehicle.

The levers 46 are of cranked form and the length of the levers 46 is somewhat less than the width of the vehicle body. One end portion of each piston and cylinder unit 42 is connected with a respective lever 46 by means of a bracket 50 which lies between opposite end portions of the lever. The levers 46 amplify the motion imparted to the brackets 50 by the piston and cylinder units 42 and applies the amplified motion to the links 44 and therefore to the support 26. The piston and cylinder units 42 are connected with the brackets 50 for pivoting relative thereto about an axis which is offset from a line joining the pivot axis 48 with the axis about which the piston and cylinder units 42 pivot relative to the body 10. This offset is an upwards direction so that, upon extension of the piston and cylinder units 42, the levers 46 are pivoted upwards about the axis 48 from the lowered position represented in Figure 3 to the raised positions represented in Figures 4 and 5. The brackets are braced by the bars 51 and links 52.

The bin carrier 14 has the form of a hollow housing open at one side which faces towards a longitudinal centreline of the vehicle. This open side of the housing is substantially closed by the support 26 when the bin carrier is in a lowered position relative to the support, as represented in Figures 1 and 3. The bin carrier is connected with the support by pivots 54 which provide for tipping of the carrier relative to the support. A tipping means for causing tipping of the bin carrier relative to the support comprises two pairs of rollers 56 on extension parts 58 of the carrier 14 at opposite sides thereof. Each pair of rollers 56 is adapted to engage with and be guided by a curved track 60 provided on the body and having a generally vertically extending entry part 62 and a transversely, generally horizontally extending part 63. As the carrier is raised by the support 26 the wheels 56 enter the lower entry part 62 of the tracks 60 and are caused to move along the curved track 60 and thus cause pivotal movement of the carrier 14 relative to the support 26 about the axis 54 as the support 26 moves to its uppermost position, thereby tipping the bin B, as shown in Figures 4

and 5.

As the carrier 14 is thus tilted relative to the support 26 the clamping member 20 is moved into clamping engagement with the lip 18 of the bin B in the following manner. The clamping member 20 is carried on a 2-armed lever 66, pivotally connected to the support 14 about an axis 68. One of the limbs of the lever 66 provides the clamping member 20 at one end thereof, whilst the other limb has a link 70 pivotally connected thereto about an axis 72 at one end and is pivotally connected at its other end to the support about an axis 74 which is offset from the axis of pivot 54 of the carrier relative to the support in a horizontal direction. Consequently, as the carrier 14 is pivoted relative to the support 26 from a position shown in Figure 6 to the tipped position shown in Figure 7, the above mentioned eccentric or offset disposition of the axes 54 and 74 causes the lever 66 to pivot to bring the clamping member 20 into clamping engagement with the lip 18.

The bin B has a lid L which is pivotally connected to the bin B by a pair of arms 76 which are pivotally connected to the bin B about an axis 78 and which extend downwardly from the lid L. The lid L has a pair of outwardly extending pins 80 which are adapted to be engaged by a respective lid opening means 82 carried at one end of each of a pair of arms 84 which are pivotally connected to a trunnion formation 86, carried by the levers 46, as shown at 88. The trunnion formations 86 have a lower transversely extending wall 90 which, when the carrier is in the position shown in Figure 3, are spaced downwardly away from the links 84 and which, when the carrier is in an intermediate position shown in Figure 4, engage the links 84 to cause the links 84 to pivot anticlockwise, as shown in Figures 3 to 5, to cause the lid opening means 82 to engage the pins 80 of the lid and move the lid from the closed position shown in Figure 4 to the open position shown in Figure 5. The lifting means each comprises an abutment face 92 to abut a peg 80 and there is a lip 96 at the upper end of the surface 92 to prevent the peg 80 leaving the upper end of the surface 92. The surfaces 92 are provided on plates 97 which are braced by tie rod 98.

In use, a bin is engaged with the clamping members 22 provided on the carrier which engage correspondingly shaped recesses on the lip 18 of the bin B. Hydraulic fluid under pressure can be supplied to the hydraulic piston and cylinder units 42 from a suitable source on the vehicle, for example a pump driven by the vehicle engine. The flow of hydraulic fluid is controlled by valves in a known manner and the valves may be controlled electrically. The electrical control system for the valves includes manually operable switches for initiating and terminating operation of the hoist and electrical limit switches for controlling the sequence of operations. The control system is arranged to supply hydraulic fluid to the piston and cylinder units 42. Initially, the support is raised from the position shown in Figure 3 to the position shown in Figure 4 and then further movement causes pivotal movement of the carrier relative to the support from the position shown in Figure 4 to the position shown in Figure 5 and, as explained previously during this process, the lid is opened by engagement of the surface 92 of the lid opener with lid 80. Accordingly, the bin carried on the carrier 14 is tipped in the opening 11 to discharge the contents of the bin into the interior of the vehicle body 10. Once this has been achieved the operation of the piston and cylinder units 42 is reversed to return the carrier 14 to its initial position shown in Figure 3, so that the bin is returned to the ground.

During upward movement of the bin carrier 14, the upper bin clamping member 20 is moved into a position close to the lower bin clamping members 22, thereby trapping the lip 18 of the bin B in the holding means. This may occur shortly after the bin has been lifted from the ground. At a corresponding position in the return travel of the bin carrier, the upper clamping member is moved away from the lower clamping member to release the bin.

Whilst the vehicle is being driven along a road, the support and the carrier are maintained in an intermediate position so as not to project below the under side of the chassis of the vehicle. The clamping means may engage and disengage with the lip 11 at or about the same position.

Another embodiment will now be described with reference to Figures 8 to 10. In this embodiment the hoist means 7 of the vehicle 1 shown in Figures 20 and 21 is replaced by that shown in Figures 8 to 10 and comprises a pair of hoists 112, 113 is mounted on the body 110 at one side of the body and near to the cab. Each of the hoists 112 and 113 is capable of operation independently of the other hoist to raise from the ground a bin and tip the bin over or in the opening 11 to discharge contents of the bin into the space defined by the body 10.

The hoist 112 comprises a bin carrier 114 having holding means for holding a bin on the carrier. The particular example of carrier illustrated in the accompanying drawings has holding means suitable for holding a bin which has an outwardly protruding lip at a top of the bin. The holding means comprises upper and lower clamping members which can be moved apart to receive the lip between them and subsequently moved towards each other to clamp the lip or to trap the lip. Additional or alternative holding means may be provided for holding different bins on the bin carrier.

The hoist further comprises a support 115 for the bin carrier. The support is arranged for reciprocation along a vertical path relative to the body 110 between a lower position in which the support lies generally below the level of the body 110 and an upper position in

which the support lies near to a top of the body. For guiding the support, there is provided a cylindrical guide 116 which is fixed with respect to the body 110. The axis of the guide 116 is substantially vertical, when the vehicle stands on level ground. The support 115 includes a slider portion 117 which embraces the guide 116 and is arranged for sliding up and down the guide. Thus, the slider portion may incorporate upper and lower bearings for running on the guide and engages the guide 16 of adequately longitudinally spaced positions so as to support the support 15 in cantilever therefrom.

The slider portion 117 of the support 115 is nearer to the front of the vehicle than is the remainder of the support. Accordingly, the guide 116 lies forwards of the path of reciprocation of the bin carrier 114 with the slider. The hoist 112 further comprises a rectilinear track 118 which is parallel to the guide 116 and is spaced rearwards of the guide. The support 115 includes a runner 119 which runs on or in the track 118 during reciprocation of the support 115. The runner cooperates with the track to restrain pivoting of the support 115 about the axis of the guide 116.

Lifting means is provided for raising the support 115 along the guide 116 and for lowering the support down the guide. The lifting means comprises an hydraulic piston and cylinder unit 120 which is mounted on the body 110, an elongated link 121 having a lower end pivotally connected with the support 115 and a lever 122 for transmitting motion from the piston and cylinder unit 120 to an upper end portion of the link 121. As shown in Figure 1, the lever 122 is mounted for pivoting relative to the body 110 about a pivot axis 123 which lies near to the top of the body and near to a side of the body remote from the hoist 112. The axis 123 extends along the length of the vehicle.

As can be seen from Figure 1, the link 121 is of cranked form so that its upper end portion lies between the opposite sides of the vehicle body, the length of the lever 122 being somewhat less than the width of the vehicle body. One end portion of the piston and cylinder unit 120 is connected with the lever 122 by means of a bracket 124 which lies between opposite end portions of the lever. The lever 122 amplifies the motion imparted to the bracket 124 by the piston and cylinder unit and applies the amplified motion to the link 121 and therefore to the support 115. The piston and cylinder unit 120 is connected with the bracket 124 for pivoting relative thereto about an axis which is offset from a line joining the pivot axis 123 with the axis about which the piston and cylinder unit 120 pivots relative to the body 110. This offset is an upwards direction so that, upon extension of the piston and cylinder unit 120, the lever 122 is pivoted upwards about the axis 123 from the lowered position represented at 122a in Figure 1 to the raised position represented at 122b.

The bin carrier 114 has the form of a hollow housing open at one side which faces towards a longitudinal centreline of the vehicle. This open side of the housing is substantially closed by the support 115 when the bin carrier is in a lowered position relative to the support, as represented at 114a in Figure 1. The bin carrier is connected with the support by a linkage which provides for tipping of the carrier relative to the support. The linkage is contained inside the bin carrier, when the bin carrier is in the lowered position. For tipping the bin carrier relative to the support, there is provided an hydraulic actuator 125. This actuator is mounted on the support 115 to be enclosed by the bin carrier, when the latter is in its lowered position. The actuator has a rotary output shaft on which one pair of links of the linkage connecting the bin carrier with the support is fixed. The bin carrier, the support, the linkage connecting them with each other and the actuator 125 may be constructed and arranged generally as disclosed in US 4773812.

Hydraulic fluid under pressure can be supplied to the hydraulic actuator 125 from a suitable source on the vehicle, for example a pump driven by the vehicle engine. The flow of hydraulic fluid is controlled by valves in a known manner and the valves may be controlled electrically. The electrical control system for the valves includes manually operable switches for initiating and terminating operation of the hoist and electrical limit switches for controlling the sequence of operations. The control system is arranged to supply hydraulic fluid to the piston and cylinder unit 120 initially, without operation of the rotary actuator 125, until the lever 122 has reached the limit of its travel. The support 115 is then positioned adjacent to the top of the vehicle body 110. The supply of hydraulic fluid to the piston and cylinder unit 120 is then terminated and the supply of hydraulic fluid under pressure to the hydraulic actuator 125 is commenced. The bin carrier 114 is swung upwards relative to the support 115 to the position shown at 14b in Figure 1 so that a bin carried on the carrier 114 is tipped in the opening 111 to discharge contents of the bin into the interior of the vehicle body 110. Once this has been achieved, operation of the actuator 125 is reversed to return the carrier 114 to its initial position relative to the support 115. Supply of hydraulic fluid to actuator 125 is then terminated and hydraulic fluid is supplied under pressure to the piston and cylinder unit 120 to drive the lever 125 downwards relative to the body 110 and thereby lower the support 115 down the guide 116 to its lowered position. This returns to the ground a bin carried on the carrier 114.

During upward movement of the bin carrier 114, the upper bin clamping member is moved into a position close to the lower bin clamping member, thereby trapping the lip of the bin in the holding means. This may occur shortly after the bin has been lifted from the ground. At a corresponding position in the return travel of the bin carrier, the upper clamping member

is moved away from the lower clamping member to release the bin. The holding means may comprise an hydraulic piston and cylinder unit for moving the upper clamping member relative to the lower clamping member.

The hoist 113 is constructed and arranged in a manner corresponding to that in which the hoist 112 is constructed and arranged. However, the guide 126 corresponding to the guide 116 lies rearwards of the bin carrier of the hoist 113 and the track 128 for the slider 127 of the hoist 113 lies immediately adjacent to the track 118. These tracks may be defined by a single component. It will be noted that the height of the tracks 118 and 128 is less than the height of the guides 116 and 126. The tracks terminate at the level of the opening 111; whereas the guides extend upwards from the opening 111. Accordingly, the tracks 118 and 128 do not obstruct access to the opening 111. As shown in Figure 2, the spacing between the bin carriers of the hoists 112 and 113 is small, when both bin carriers are in their lowered positions. The bin carriers are immediately adjacent to the tracks 118 and 128. During tipping of the bin carriers, respective bins carried thereon pass through the space above the upper end of the tracks 118 and 128 and through the gap between the guides 116 and 126.

As can be seen from Figure 1, the hoists 112 and 113 protrude laterally of the vehicle only a short distance beyond the side wall of the body 110. Mounting of the respective supports of the hoists between the guides 116 and 126 contributes to the lateral compactness of the hoists. The fact that the bin carrier 114 has a hollow housing and disposing the rotary actuator 125 and the links which connect the bin carrier with the support 115 all inside the carrier, when the latter is in its lowered position, contributes further to the lateral compactness of the hoist.

Suitable means for opening the lid of the bin may be provided such as that of the first or the third embodiments.

A third embodiment will now be described with reference to Figures 11 to 24. In this embodiment the hoist means 7 of the vehicle 1 of Figures 20 and 21 is replaced by that shown in Figures 11 to 24 and comprises a pair of hoists 212, 213, mounted on the body 10 at one side of the body and near to the cab. Each of the hoists 212 and 213 is capable of operation independently of the other hoist to raise from the ground a bin B and tip the bin over in the opening 11 to discharge the contents of the bin into the space defined by the body 10.

The hoist 212 comprises a bin carrier 214 having holding means for holding a bin B on the carrier. The particular example of carrier illustrated in the accompanying drawings has holding means 216 for holding a bin which has an outwardly protruding lip 218 at the top of the bin. The holding means comprises upper and lower clamping members 220, 222 (Figs. 18 & 19), which can be moved apart to receive the lip 218 between them and subsequently move towards each other to clamp the lip 218 as hereinafter to be described. In addition, the bin carrier 14 is provided with a suction cup 224 which is resiliently mounted on the bin carrier 214 so that the cup can conform to the bin. The control means of the apparatus causes a vacuum to be applied to the cup 224 as the bin is being lifted, as hereinafter to be described, so as to facilitate holding the bin to the carrier. Additional or alternative holding means may be provided for holding different bins on the bin carrier.

The hoist 212 further comprises a support 226 for the bin carrier 214. The support is arranged for reciprocation along a vertical path relative to the body 10 between a lower position shown in Figures 11 and 13, in which the support lies generally below the level of the body 10 and an upper position, shown in Figures 14 and 15, in which the support lies near to the top of the body. For guiding the support there is provided a guide means 228 which is fixed with respect to the body 10. The guide means 228 comprises a cylindrical guide member 230. The axis of the guide member 230 is substantially vertical, when the vehicle stands on level ground. The support 214 includes a slider portion 231 which embraces the guide member 230 and is arranged for sliding up and down the guide member. Thus the slider portion may incorporate suitable bearings such as upper and lower, phosphor bronze bearings for running on the guide member. The slider portion 231 of the support 226 is nearer to the front of the vehicle than is the remainder of the support. Accordingly, the guide member 230 lies forwards of the path of reciprocation of the bin carrier 214 with the support 226.

The hoist 212 further comprises a rectilinear track 232 which is parallel to the guide member 230 and is spaced rearwards of the guide member. The support 226 includes a slider portion 233 which runs on or in the track 232 during reciprocation of the support. Suitable bearing means such as phosphor bronze shoes are provided to facilitate such sliding movement. The slider portion 233 cooperates with the track 232 to restrain pivoting of the support 226 about the axis of the guide member 230.

The slider portion 231 of the support 226 is sufficiently long so as to engage the guide member 230 at adequately longitudinally spaced positions to support the slider in cantilever from the guide member 230.

Lifting means 240 is provided for raising the support 226 along the guide means 228 and for lowering the support down the guide means. The lifting means 240 comprises a hydraulic piston and cylinder unit 242 which is mounted on the body 10 on opposite sides thereof, an elongated link 244, the lower end of which is pivotally connected with the support 226 adjacent to the slider portion 231, shown at 244a and a

lever 246 for transmitting motion from the piston and cylinder unit 242 to an upper end portion of the link 244. The lever 246 is mounted for pivoting relative to the body 10 about a pivot axis 248 which lies near to the top of the body and near to a side of the body remote from the hoist 212. The axis 248 extends parallel to the length of the body. The lever 246 is of cranked form and the length of the lever 246 is somewhat less than the width of the vehicle body. The end portion of the piston and cylinder unit 242 is connected with the lever 246 by means of a bracket 250 to slide with opposite end portions of the lever 246. The lever 246 amplifies the motion imparted to the bracket 250 by the piston and cylinder unit 242 and applies the amplified motion to the link 244 and therefore to the support 226. The piston and cylinder unit 242 is connected with the bracket 250 for pivoting relative thereto about an axis which is offset from a line joining the pivot axis 248 with the axis about which the piston and cylinder unit 242 pivots relative to the body 10. This offset is in an upwards direction so that, upon extension of the piston and cylinder unit 242, the lever 246 is pivoted upwards about the axis 248 from the lowered position represented in Figure 13 to the raised position represented in Figures 14 and 15. The bracket 250 is braced by the bar 251 and link 252.

Bin carrier 214 has the form of a hollow housing open at one side which faces towards a longitudinal centre line of the vehicle. This open side of the housing is substantially closed by the support 226 when the bin carrier is in a lowered position relative to the support, as represented in Figures 11 and 13. The bin carrier is connected with the support by pivot 254 (Figs. 18 & 19) which provides for tipping of the carrier relative to the support. The tipping means for causing tipping of the bin carrier relative to the support comprises a pair of rollers 256 on an extension part 258 of the carrier 214. A pair of rollers 256 is adapted to engage with and be guided by a curved track 260 provided on the body 10 and have a generally vertically extending entry part 262 and a transversely generally horizontally extending part 263. As the carrier is raised by the support 226 the wheels 256 enter the lower entry part 262 of the track 260 and are caused to move along the curved track 260 and thus cause pivotal movement of the carrier 214 relative to the support 226 about the axis 254 as the support 226 moves to its uppermost position, thereby tipping the bin B as shown in Figures 14 and 15.

As the carrier 214 is thus tilted relative to the support 226 the clamping member 220 is moved into clamping engagement with the lip 218 of the bin B in the following manner.

The clamping member 220 is carried on a two armed lever 266 pivotally connected to the support 214 about an axis 268. One of the limbs of the lever 266 provides a clamping member 220 at one end thereof, whilst the other limb has a link 270 pivotally connected thereto about an axis 272 at one end and is pivotally connected at its other end to the support about an axis 274 which is offset from the axis of pivot of the carrier relative to the support in a horizontal direction. Consequently, as the carrier 214 is pivoted relative to the support 226 from the position shown in Figure 18 to the position shown in Figure 19 the above mentioned eccentric or offset disposition of the axes 254 and 274 causes the lever 266 to pivot to bring the clamping member 220 into clamping engagement with the lip 218.

A large bin B has a lid L which is pivotally connected to the bin B by a pair of arms which are pivotally connected to the bin B about an axis 278 and which extend downwardly from the lid L. The lid has a pair of pins 80 on opposite sides thereof which are adapted to be engaged by a lid opening means 282 carried at one end of each of two arms 84 each of which is pivotally connected to a trunnion formation 286 carried by the lever 246 as shown at 288. The trunnions 286 have a lower transversely extending wall 290 which, when the carrier is in the position shown in Figure 13, is spaced downwardly away from the link 284 and which, when the carrier is in the intermediate position shown in Figure 14, engages the link 284 to cause the link 284 to pivot anti-clockwise, as shown in Figures 13 to 15, to cause each lid opening means 282 to engage a respective pin and move the lid from the closed position to the open position shown in Figure 15.

The lid lifting means comprises an abutment face 292 with a lip 296 at the upper end of the surface 292 to prevent the peg 280 leaving the upper end of the surface 292. The surface 292 is provided on a plate which is welded to the link 84 and to a further link 285 and an upright 286. The upright 286 is provided with a rubber buffer 287 which is adapted to engage the lid L to prevent the bin falling into the opening 11 if by mischance it becomes disengaged from the carrier 214. A similar buffer is provided in the first embodiment as shown at 87.

In use, (Fig.16) a small bin SB of a size adapted for a single hoist, B is engaged with the clamping members 222 provided on the carrier 214 which engage correspondingly shaped recesses on the lip 218 of the bin.

Hydraulic fluid under pressure is applied to the hydraulic piston and cylinder unit 42 from a suitable source on the vehicle, for example, a pump driven by the vehicle engine with or without a reservoir being incorporated in the circuit. The flow of hydraulic fluid is controlled by valves in known manner and the valves may be controlled electrically, for example, under the control of an electronic programmable controller. The electrical control system for the valves may include manually operable switches for initiating and terminating operations of the hoist and electrical limit switches for controlling the sequence of operation.

The control system is arranged to supply hydraulic fluid to the piston and cylinder unit 42 so that initially the support is raised from the position shown in Figure 13 to the position shown in Figure 14 and then further movement causes pivotal movement of the carrier relative to the support from the position shown in Figure 14 to the position shown in Figure 16 and during this the lid is opened by gravity. Accordingly, the bin carried on the carrier 214 is tipped in the opening 11 to discharge the contents of the bin into the interior of the vehicle body 10. Once this has been achieved the operation of the piston and cylinder unit 42 is reversed to return the carrier 214 to its initial position shown in Figure 3 and so the bin is returned to the ground.

During upward movement of the bin carrier 214 the upper bin clamping member 220 is moved into a position close to the lower bin clamping members 222, thereby trapping the lid 218 of the bins B in the holding means. This may occur shortly after the bin has been lifted from the ground. At a corresponding position on the return travel of the bin carrier, the upper clamping member is moved away from the lower clamping member to release the bin and, in addition, appropriate vaccuum is applied during the lifting operation.

The hoist 213 is constructed and arranged in a manner corresponding to that in which the hoist 212 is constructed and arranged and hence further detailed discussion is not necessary. However, the guide 230a corresponding to the guide 230 lies rearwards of the bin carrier of the hoist 213 and the track 232a of the slider 231a of the hoist 213 lies immediately adjacent the track 232. These tracks may be defined by a single component. It will be noted that the height of the tracks 232, 232a is less than the height of the guides 230, 230a. The tracks terminate at the level of the opening 11 whereas the guides extend upwards from the opening 11. Accordingly the tracks 232, 232a do not obstruct access to the opening 11. As shown in Figure 11 the spacing between the bin carriers 214, 214a of the hoist 212, 213 is small when both bin carriers are in their lowest positions. The bin carriers are immediately adjacent to the tracks 232, 232a. During tipping of the bin carriers, respective bins carried thereon past the space above the upper ends of the tracks 232, 232a and through the gap in the guides 230, 230a. As can be seen from the Figures, the hoist protrudes laterally of the vehicle only a short distance from the side wall of the vehicle 10. Mounting of the respective supports of the hoists between the guides contributes to the lateral compactness of the hoists. The fact that the bin carriers have a hollow housing with associated pivots and links all inside the carrier when the latter is in its load position contribute further to the latter compactness of the hoists.

Referring now to Figures 17 to 19, interconnecting means 300 are provided whereby the supports 226, 26a of the hoists 212, 213 may be mechanically connected together. The interengaging means comprises a socket 301 provided on the support 226 of the hoist 212 and a pin 302 mounted for slidable movement in a mounting 303 of the support 226a of the hoist 213. The pin 302 is engaged with the piston rod 304 of a hydraulic piston and cylinder device 305 so that it can be reciprocated between a disengaged position shown in Figure 17 and an engaged position in which the pin 302 is cause to project outwardly of the mounting 303 and into the socket 301.

When the hoists 212, 214 are interconnected they may be used to raise relatively large "trade waste" containers such as that shown at B in Figures 13 and 15. In this case the lifting means 282 is operative to open the lid as described above.

The electrical control system is arranged so that the vehicle may be operated in an independent mode or in a combined mode.

In independent mode the bins are offered up against the carrier of the respective hoists. The bins contact a suitable lever 310, Figure 23, which is rotated against the bias of a spring 311 to cause a pin 312 to actuate a proximity switch 313 to cause the appropriate hoist section to raise as described hereinbefore. Provided the bin is correctly located against its respective carrier, the hoist will raise and when the clamping member 220 engages the rim of the bin it operates a respective second sensor. The second sensor is shown in Figure 24 and comprises a lever 320 which is rotated against the bias of a spring 321 to cause a pin 322 to actuate a proximity switch 323 when the bin is correctly positioned on the clamping means 222. Upon completing both switch functions correctly the hoist will raise fully and tip the container into the vehicle body as described hereinbefore.

The bins will remain fully tipped for a pre-set time period and then descend to the ground. The bin should then be manually moved clear of the carrier so that the sensor does not detect the presence of the bin to prevent the raise and lowering sequence being repeated.

In the event that either the second proximity sensor and associated switch does not engage correctly after its respective first sensor and switch has been operated, the respective hoist will raise to a predetermined height sensed by a further sensing means and will stop and return automatically to the floor to allow the bin to be correctly located on its carrier.

In order to raise larger bins the hoists must be interlocked.

When it is desired to carry a large bin the control mechanism is actuated to be moved to the combined mode and this causes the hydraulic cylinder device 305 to be actuated to move the interlocking plunger 302 to connect the supports 226, 226a together.

Operation of the interlocked hoists is by use of

manually engageable controls such as push buttons.

Push buttons may be provided to permit of manual operation in individual mode but when used in combine mode only one set of buttons may be operable. For safety reasons the push buttons may be arranged to be required to be held in the required raising or lowering operation to be performed. If desired, the push buttons may be provided on a mobile control unit connected to the vehicle by appropriate cable.

Operation of a raise push button will cause the hoist sections to be actuated to be raised together. However, in the event that either of the second sensor and associated switches are not correctly fully operated, the hoists will raise only to a predetermined height sensed by a further sensor and will stop at that position until lowered to the floor by push button operation to enable the bin to be correctly located. After relocating the bin correctly on the hoists the raise push button will then permit the hoists to raise the bin and to tip it into the body hopper.

Pushing a down button will cause the bin to be lowered to the ground. Release of either the raise or the lower buttons at any stage will cause upward or downward movement of the bin to cease.

At all stages of raising and lowering the hoists one of a plurality of emergency stop button disposed at appropriate positions on the vehicle may be actuated to stop the hoists. The hereinbefore mentioned packing mechanism 15 may be arranged to be operated after every alternative lift.

A hydraulic control system is provided as shown in Figure 22.

The hoists are controlled hydraulically by a two spool proportional control valve. The left hand hoist works from one spool and the right hand hoist from the other spool.

In individual mode the spool is moved to supply pressure and volume to the piston head side of the respective cylinder 242. The raise and lower actions are continuous movements with necessary damping action supplied internally in the cylinders on both ends to prevent hard impacts on the cylinder components. The speed and movement of operation is controlled by the appropriate spool with proportional ramping on initial upward actuation. The appropriate cylinder will move full stroke to cause the hoist mechanism to raise and fully tip into the hopper area of the vehcile body.

The spool movement is reversed to produce downward motion of the hoist and the hoist will de-rotate mechanically and be lowered to the floor. Both the left and right hoists work in a similar fashion.

The hoists can be interlocked together to raise and lower a larger range of bins. This entails the mechanical interlock 30 being applied between the left and right hoists. This is an automatic operation but the interlock can only be applied when both hoists are in the fully down condition.

The automatic actuators described with reference to Figure 23 are only applicable in individual mode.

In a combined interlocked mode the manual raise and lower buttons on the body or mobile or pendant control are operative.

The pendant control allows the bins to be more readily pushed into the correct lift position relative to the hoist because the user can adjust the bin position whilst holding the pendant and not moving to the side of the vehicle body to operate a button.

In combined mode only the left hand buttons and pendant control are operative.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A collection vehicle comprising a body defining a chamber for receiving the material collected and an opening adjacent to a top of the body and communicating with the chamber, running wheels, an engine for driving at least some of the running wheels, a cab for accommodating a driver and at least one hoist mounted on the body at one side of the body, wherein the or each hoist is capable of operation to raise from the ground beside the vehicle a bin and to tip the bin in or over the opening to discharge contents of the bin into the vehicle body, the hoist comprising a bin carrier, holding means for holding the bin on the carrier, a support for the bin carrier, a connecting means connecting the bin carrier with the support for tipping of the carrier relative to the support, tipping means for tipping the bin carrier relative to the support, a guide means for guiding the support for upwards and downwards movement relative to the body, and lifting means for raising the support and lowering the support along the guide means.

2. A vehicle according to claim 1 wherein a pair of hoists are mounted on the body at said one side of the body and each hoist is capable of operation independently of the other hoist to raise from the ground beside the vehicle a bin and to tip each bin in or over the opening to discharge contents of the bin into the vehicle body.

3. A vehicle according to claim 2 wherein each guide means is cylindrical.

4. A vehicle according to claim 2 or claim 3 wherein each guide means guides each support along a rectilinear path and a rectilinear track is provided which is parallel to each guide means.

5. A vehicle according to claim 4 wherein each support embraces a guide means and is a sliding fit therewith, the support having a runner which runs along a track and restrains the support against turning about the axis of the guide means.

6. A vehicle according to claim 4 or claim 5 wherein one of the guide means is displaced forwards from the other guide means, the respective supports of the hoists lie mainly between the guide means and the respective tracks lie substantially between the supports of the two hoists.

7. A vehicle according to any one of claims 4 to 6 wherein each support is mounted in cantilever on the guide means.

8. A vehicle according to any one of claims 2 to 7 wherein interlocking means are provided mechanically to interlock the hoists.

9. A vehicle according to any one of claims 2 to 8 wherein the guide means have respective upper end portions which lie above the level of the upper ends of the tracks.

10. A vehicle according to any one of the preceding claims wherein the lifting means of the or each hoist comprises an hydraulic piston and cylinder unit and a lever for transmitting motion from the piston and cylinder unit to the support with amplification of the movement.

11. A vehicle according to Claim 10 wherein the piston and cylinder unit of the lifting means lies above the chamber defined by the body.

12. A vehicle according to Claim 10 or Claim 11 wherein the lever is mounted on the body for pivoting relative thereto about a pivot axis which extends along the vehicle and which is nearer to a side of the vehicle body remote from the or each hoist than to the side of the vehicle body at which the or each hoist is mounted.

13. A vehicle according to any one of claims 10 to 12 wherein the lever is connected to the support by a link means pivotally connected to the lever and to the support.

14. A vehicle according to any one of claims 10 to 13 wherein there are two hoists each of which is provided with a said lifting means.

15. A vehicle according to any one of claims 10 to 13 wherein there is a hoist provided with two of said lifting means one at each of two opposite sides thereof.

16. A vehicle according to any one of the preceding claims wherein the guide means have respective upper end portions which lie above the level of the opening.

17. A vehicle according to any one of the preceding claims wherein the tipping means of the carrier comprises a guide surface and a guided member movable along a track as the support is raised.

18. A vehicle according to any one of the preceding claims wherein the holding means comprises first and second holding members adapted to engage a portion of a bin, relative movement of the holding members into engagement with the bin being caused by a linkage provided between the carrier and the support effective to cause said clamping movement when the carrier is pivoted relative to the support.

19. A vehicle according to claim 18 wherein the linkage comprises a link pivotally connected to the carrier and pivotally connected to the support about an axis offset from the axis of pivotal connection of the carrier to the support.

20. A vehicle according to claim 10 or any one of claims 11 to 19 when directly or indirectly dependent on claim 10, which further comprises a lid opening means operable to open the lid as a result of operation of the hoist and the lid opening means is moved by a drive derived from said lever for transmitting motion from the piston and cylinder unit to the support and wherein said lever is provided with a lost motion device whereby initial movement of said lever for initial lifting of a bin does not cause movement of the lid opening means and further movement of said lever causes movement of the lid opening means to open the lid.

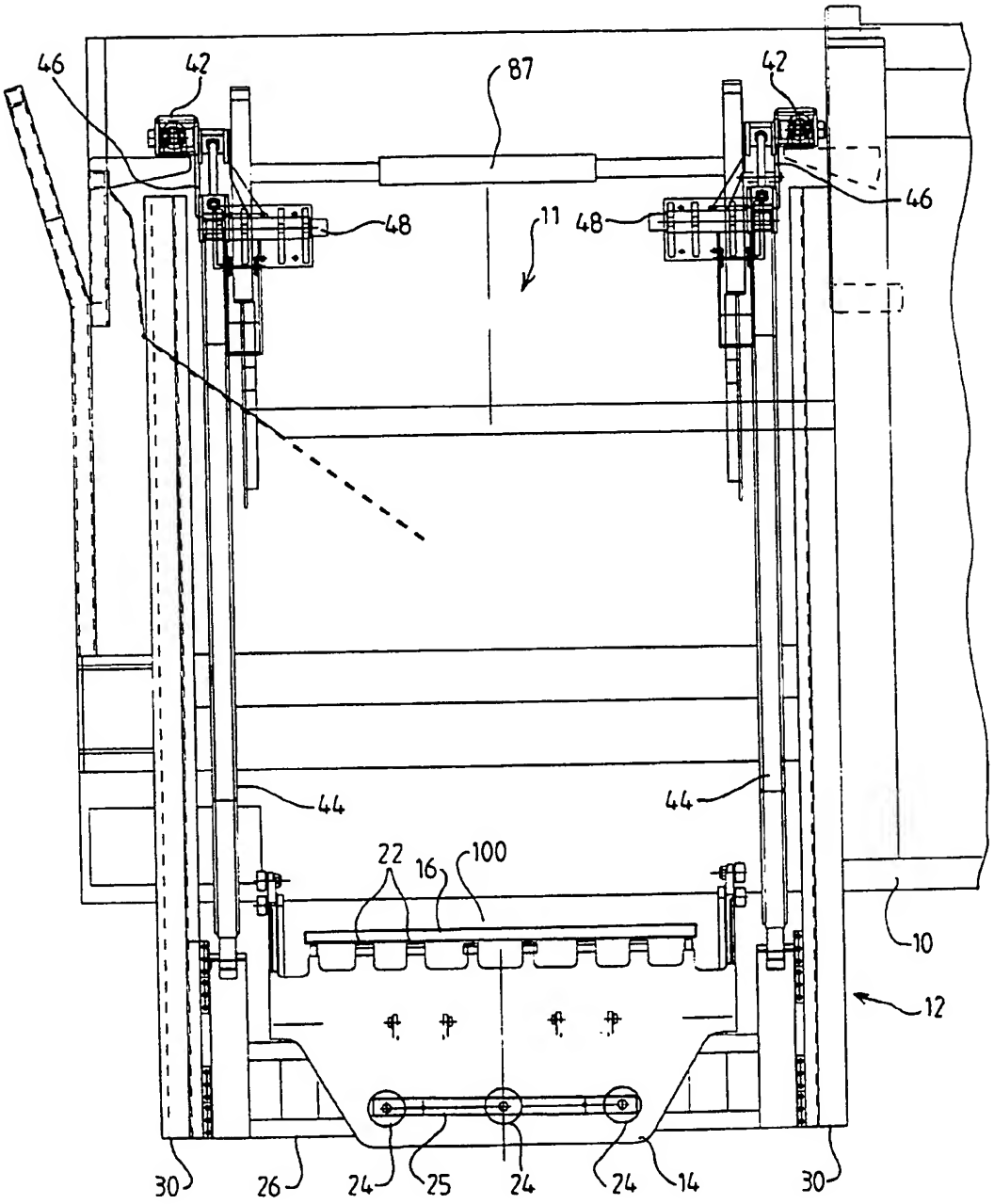

FIG 1

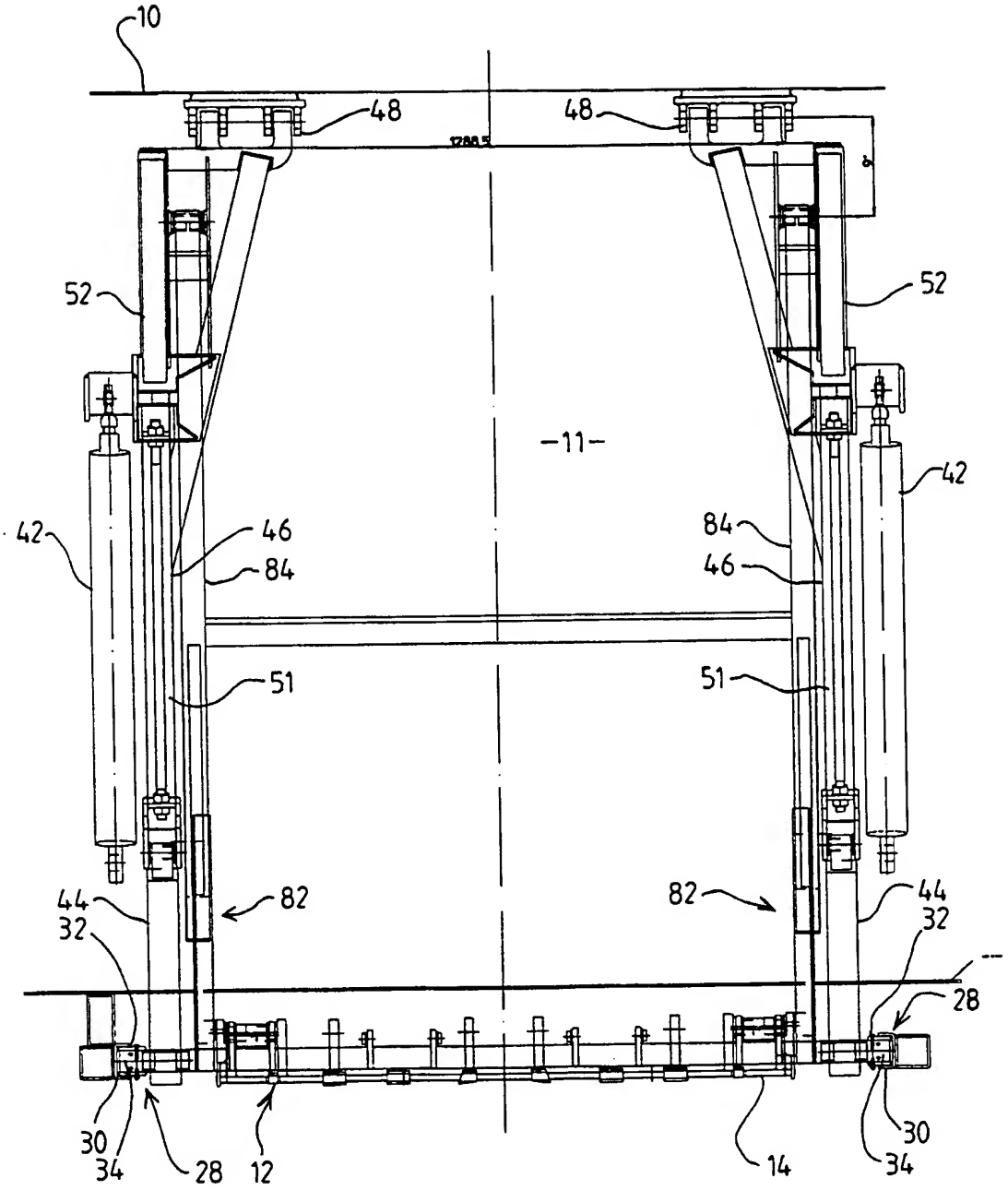
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FIG 2

FIG 3

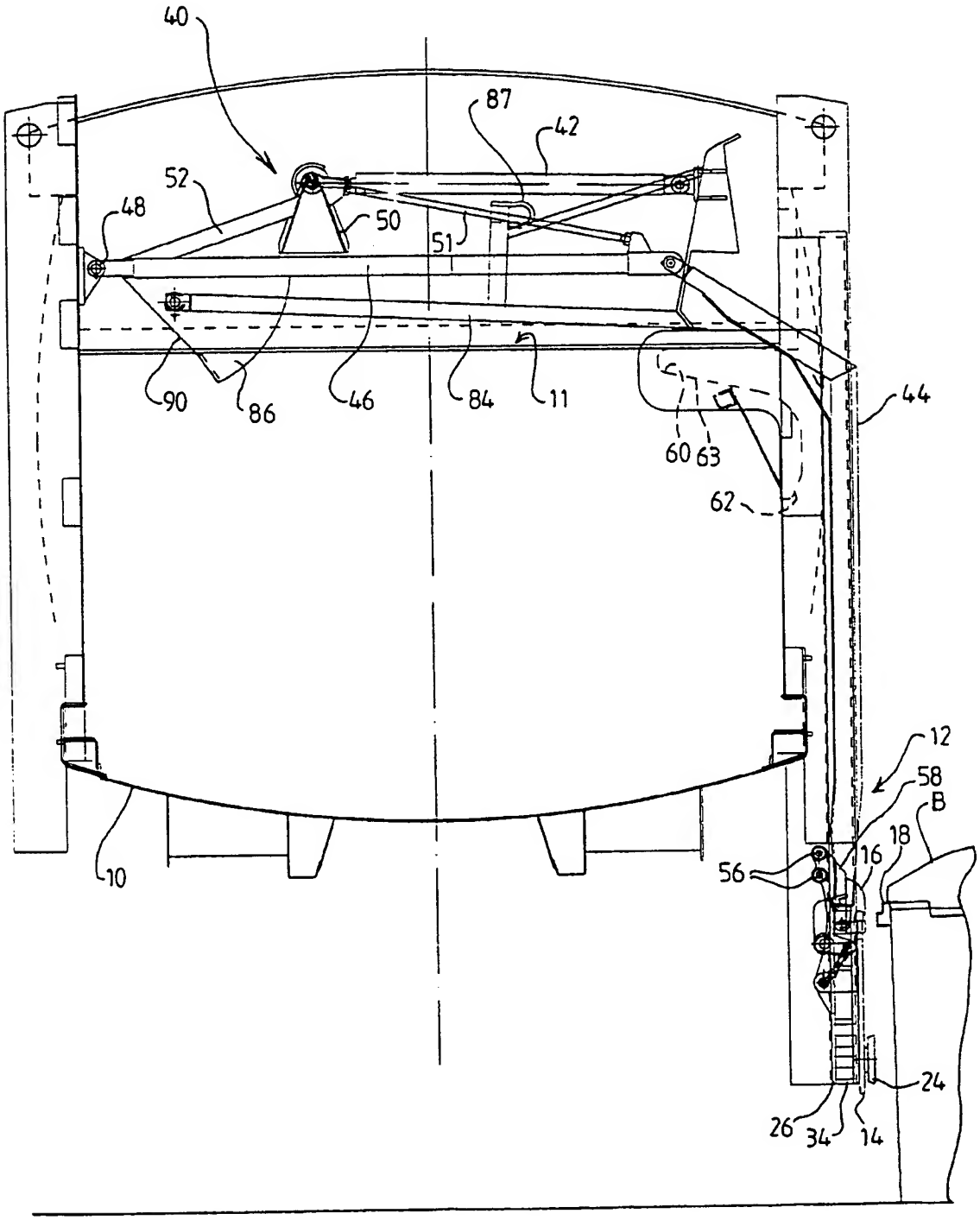
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FIG 4

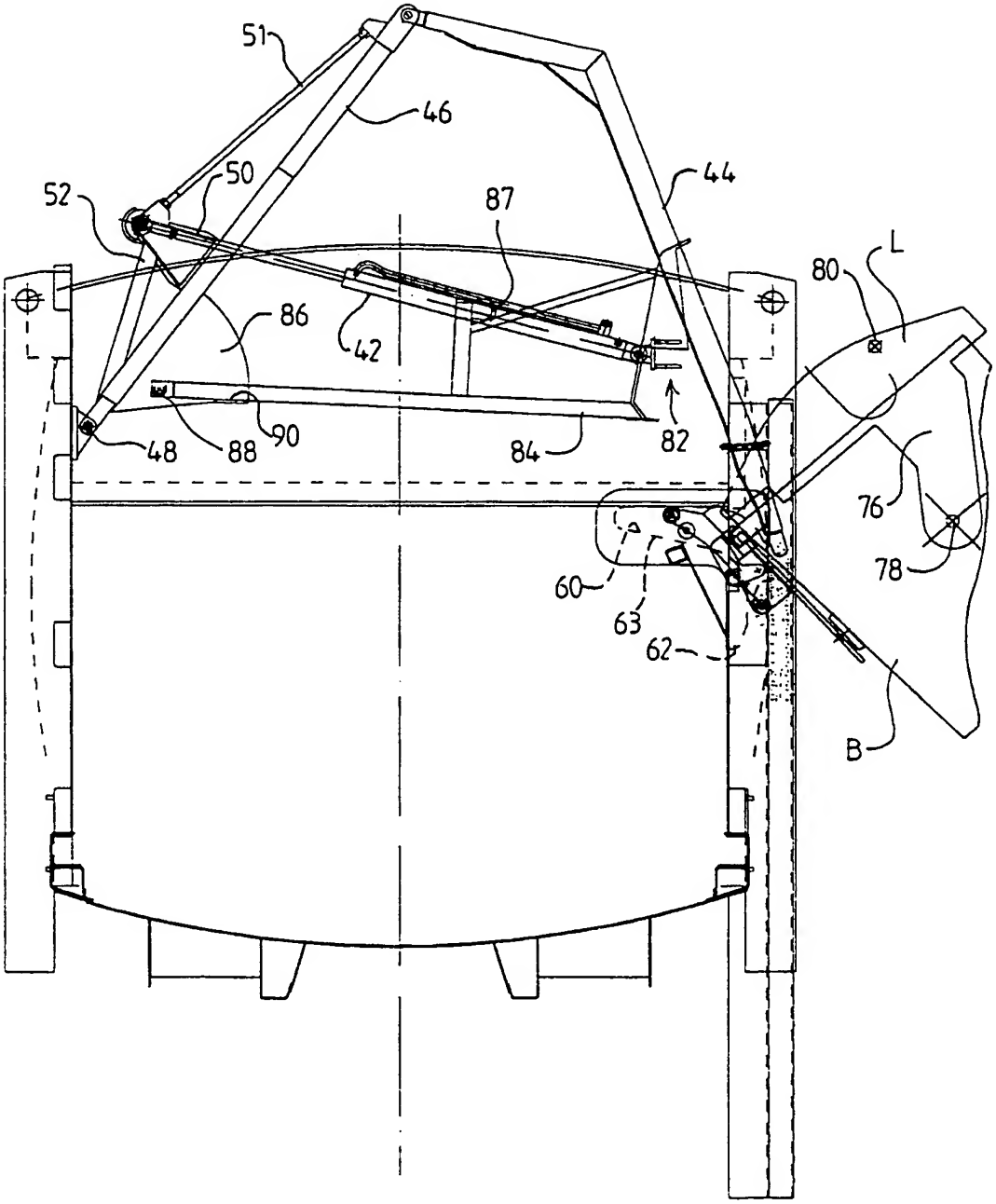
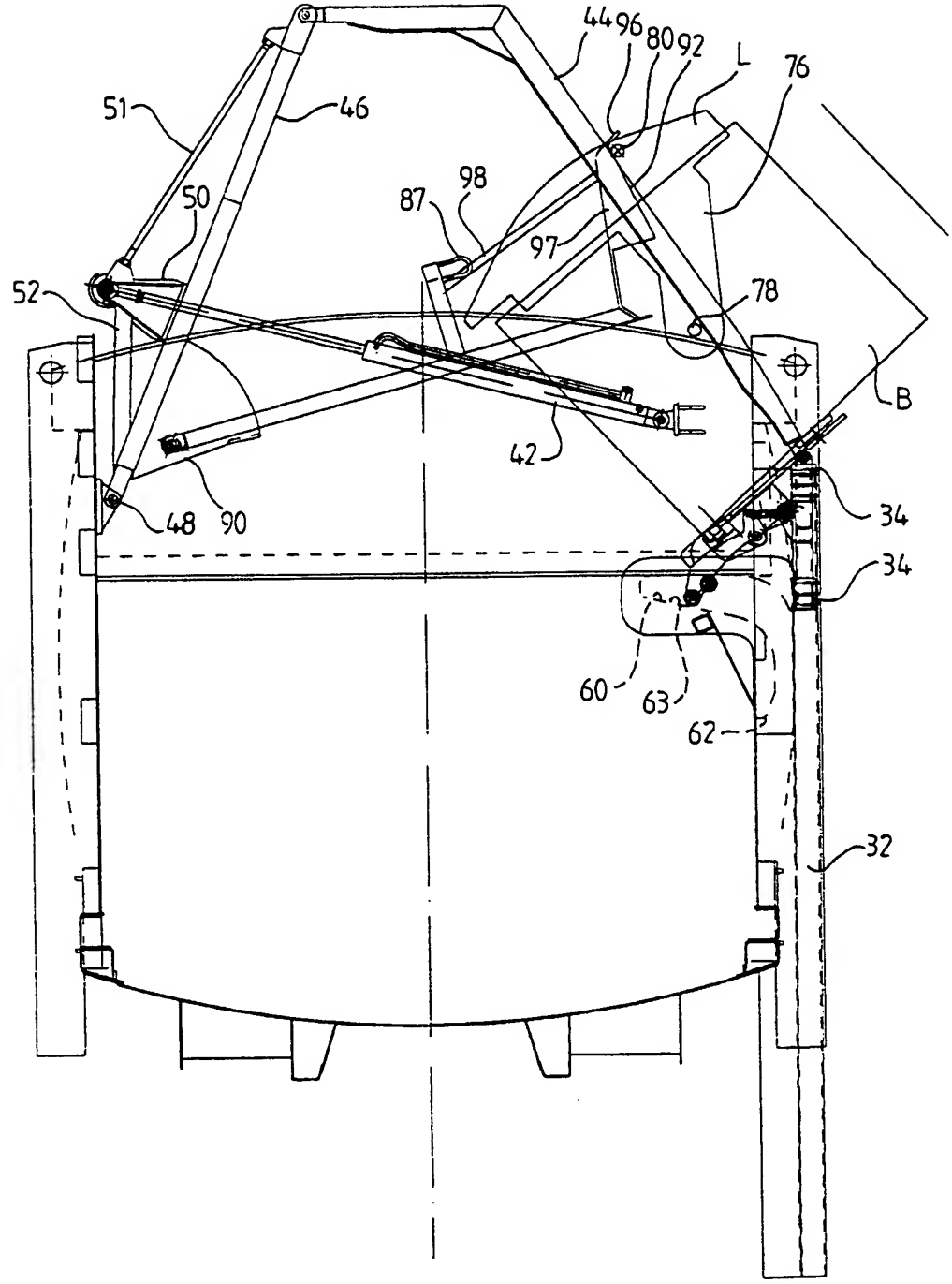


FIG 5



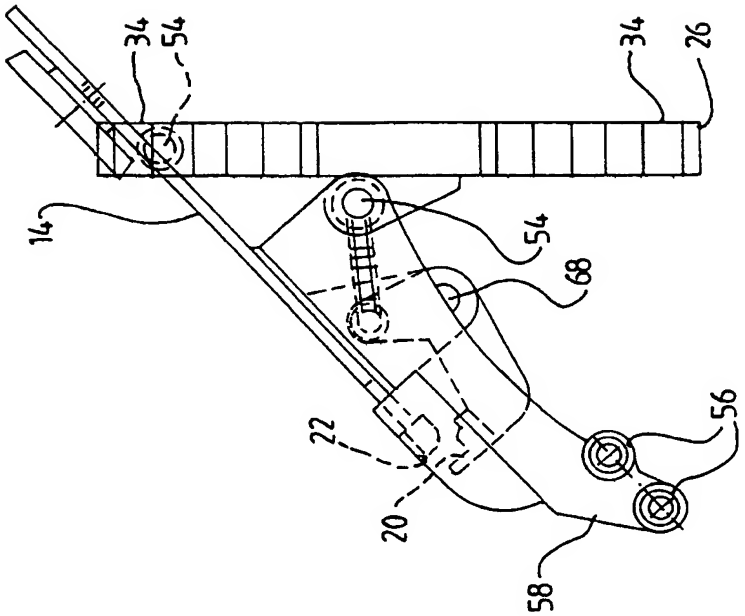

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FIG 7

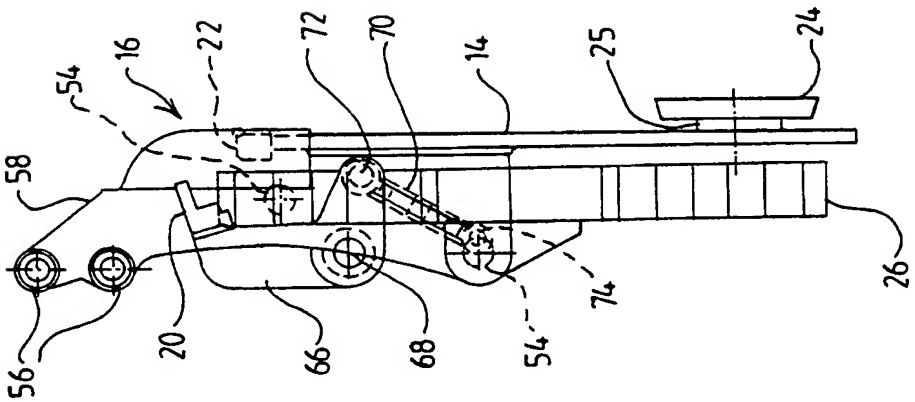
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FIG 6

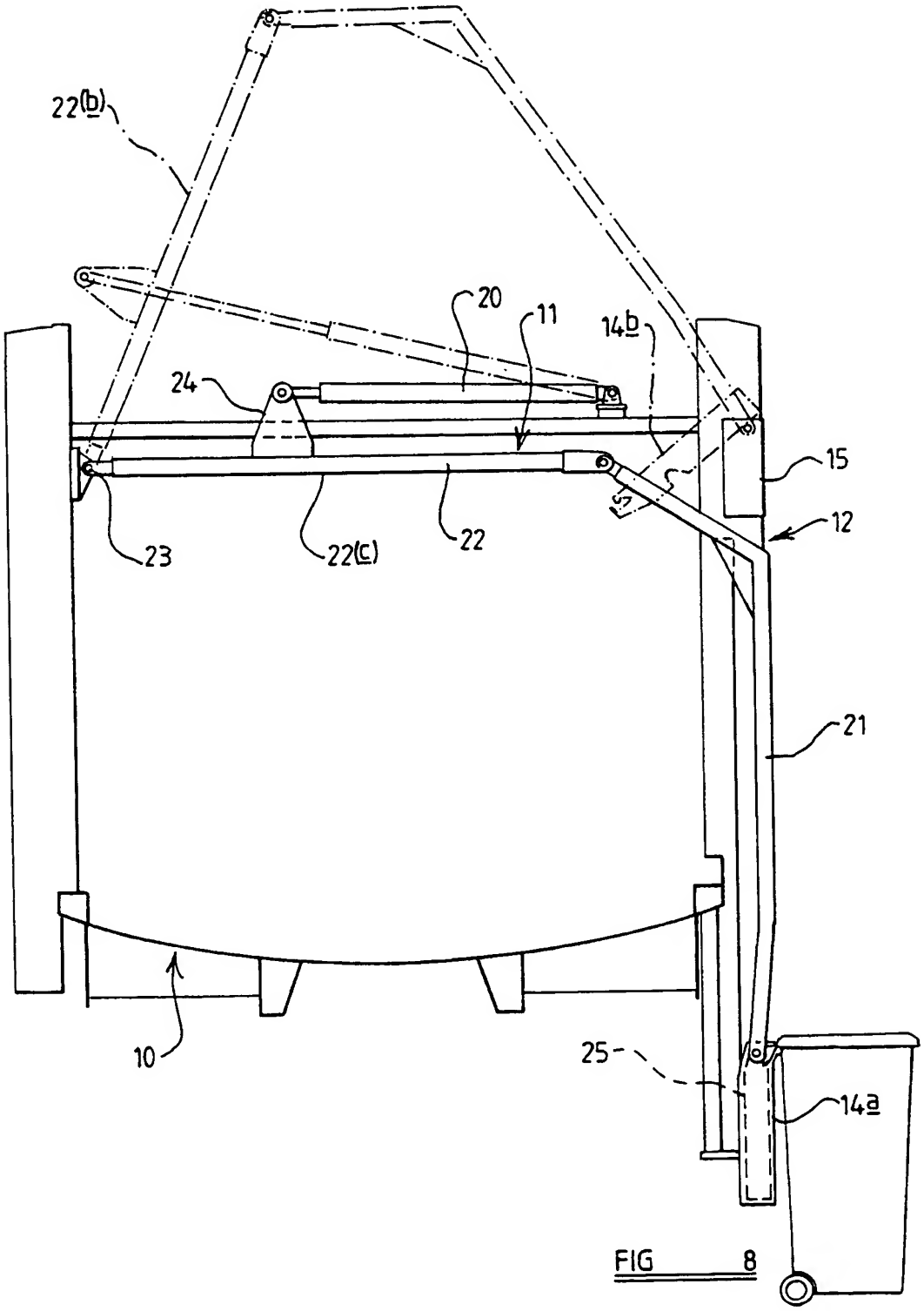
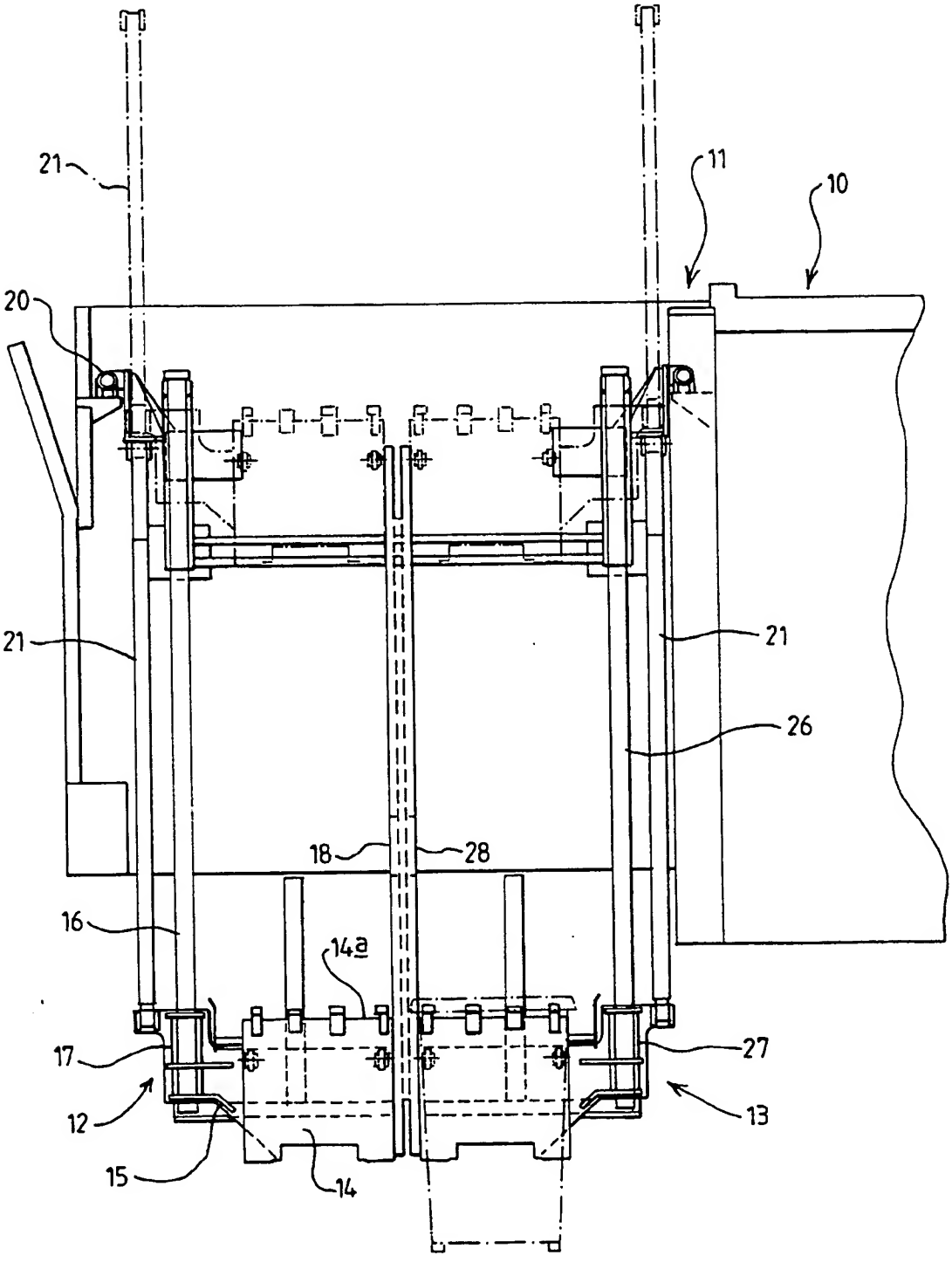


FIG 8

FIG 9



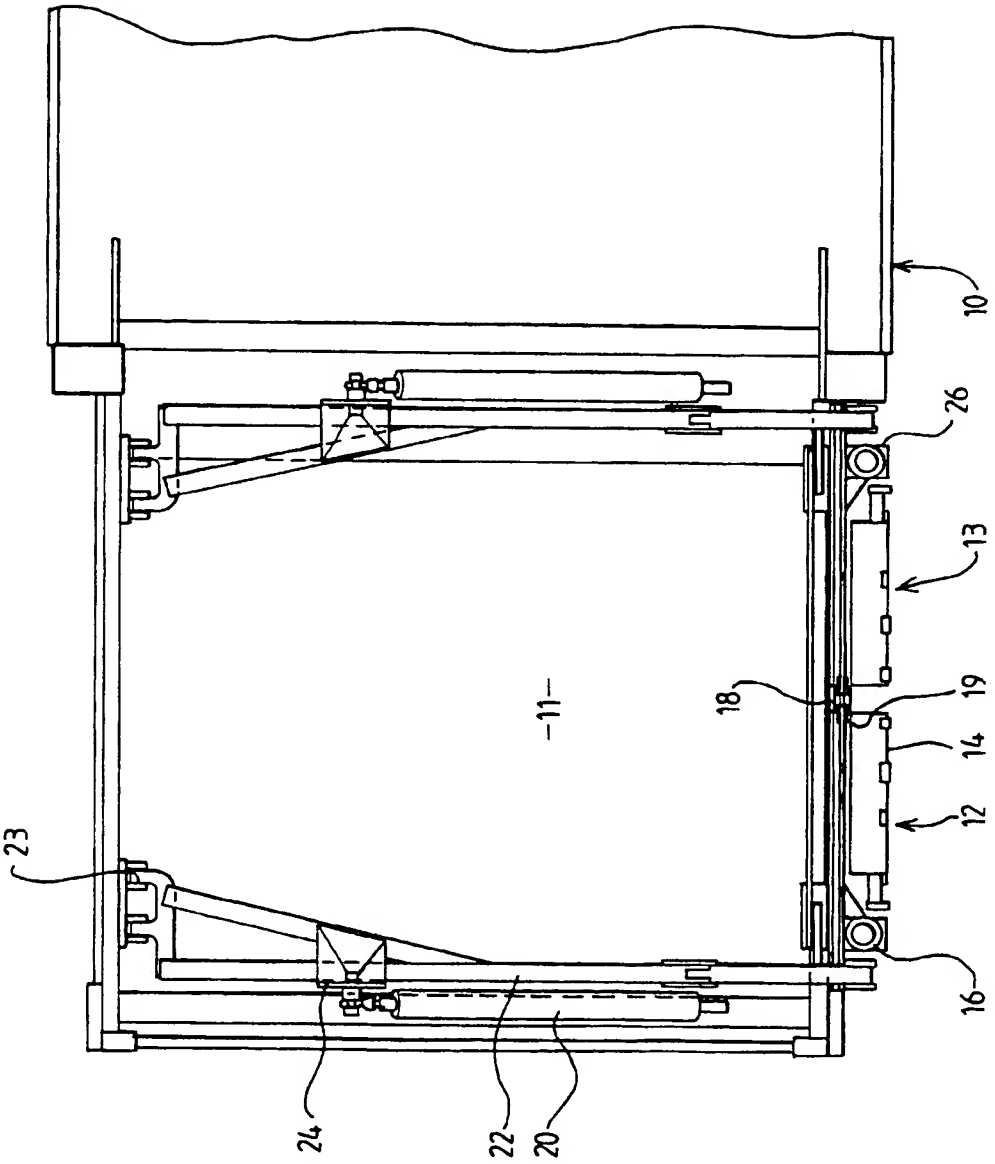
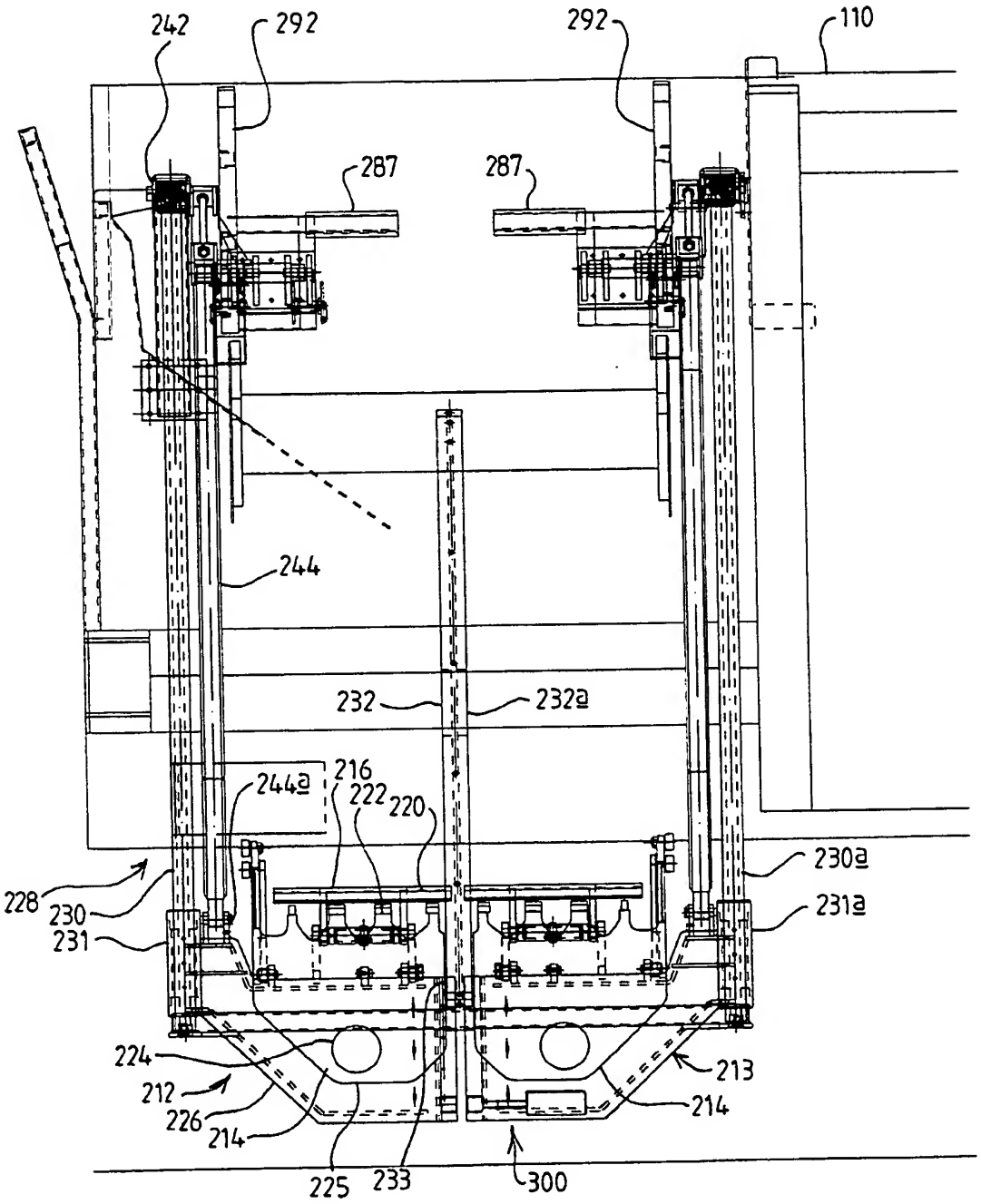


FIG 10

FIG 11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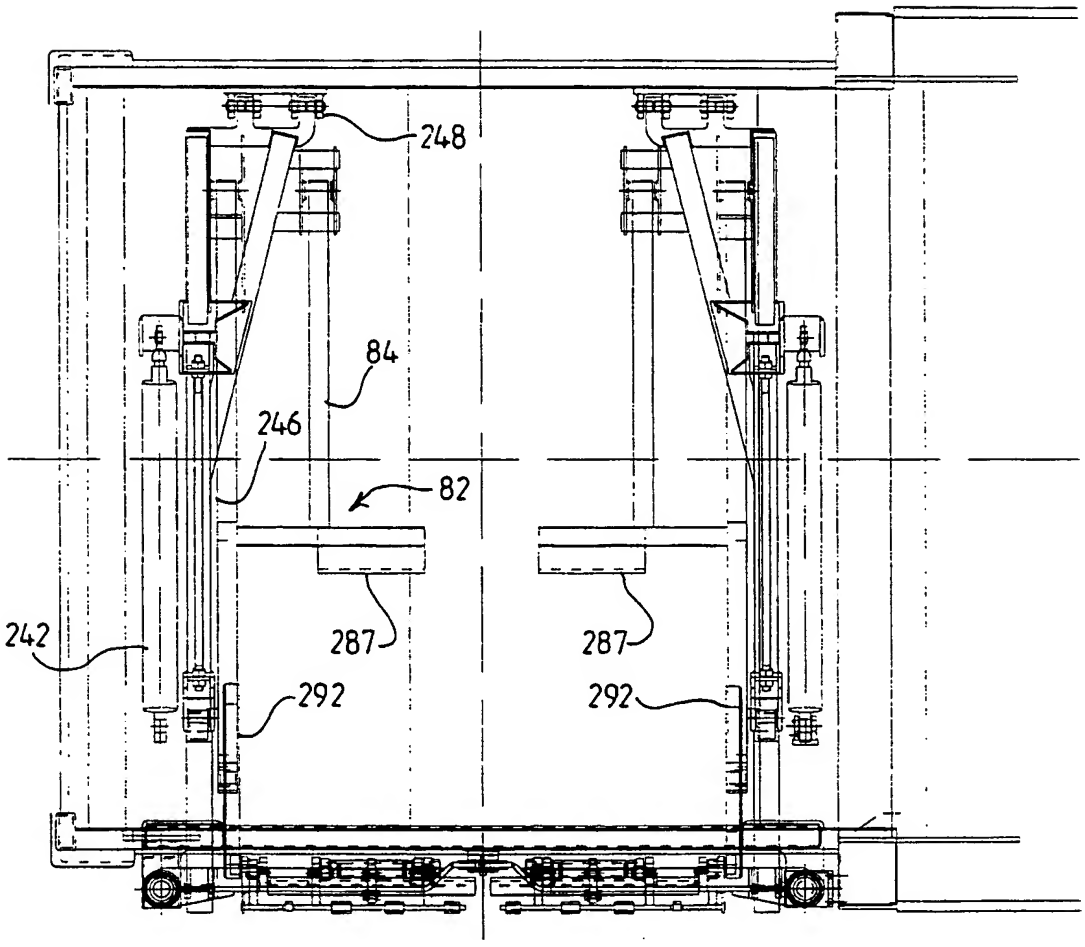

FIG 12

FIG 13

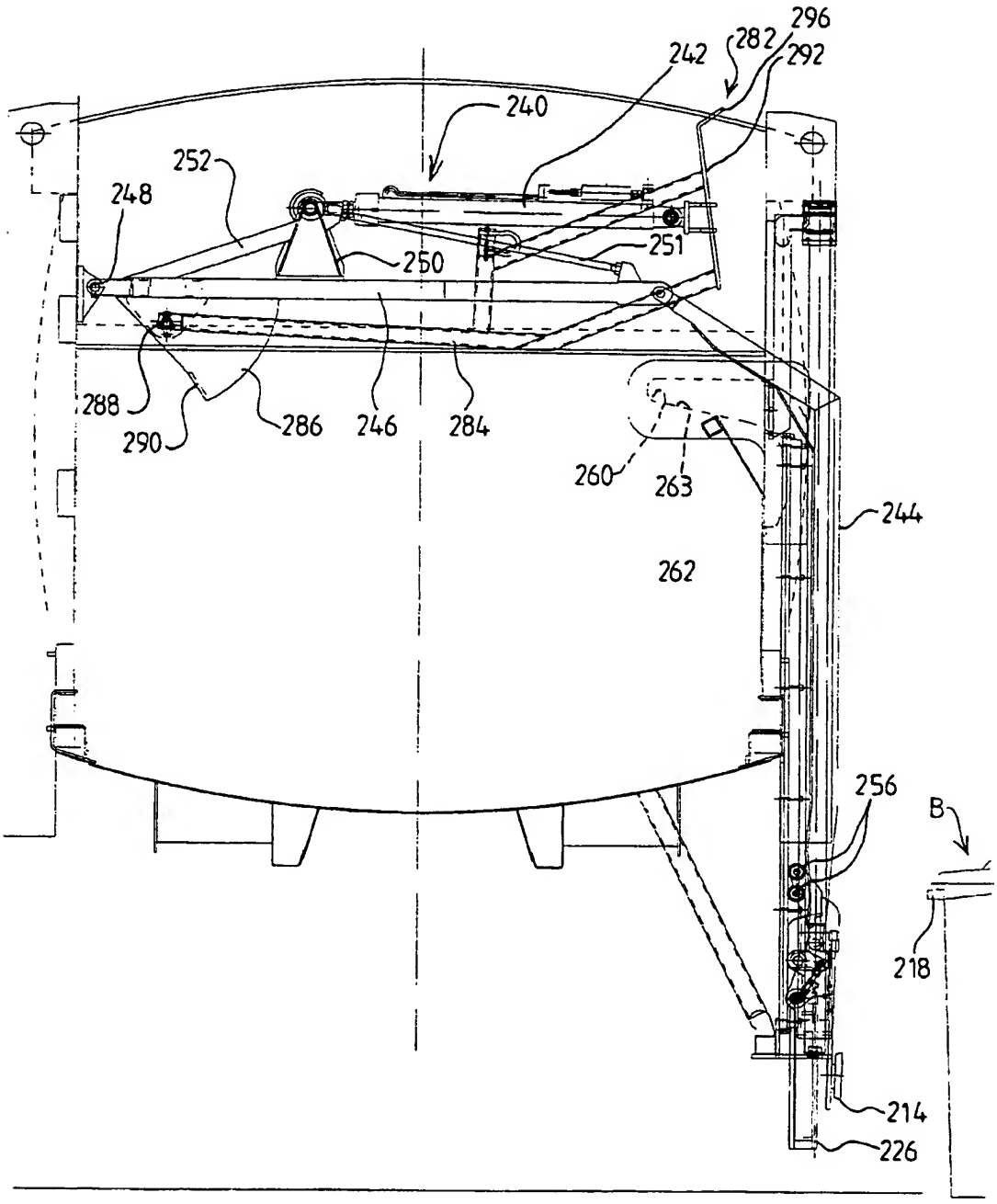
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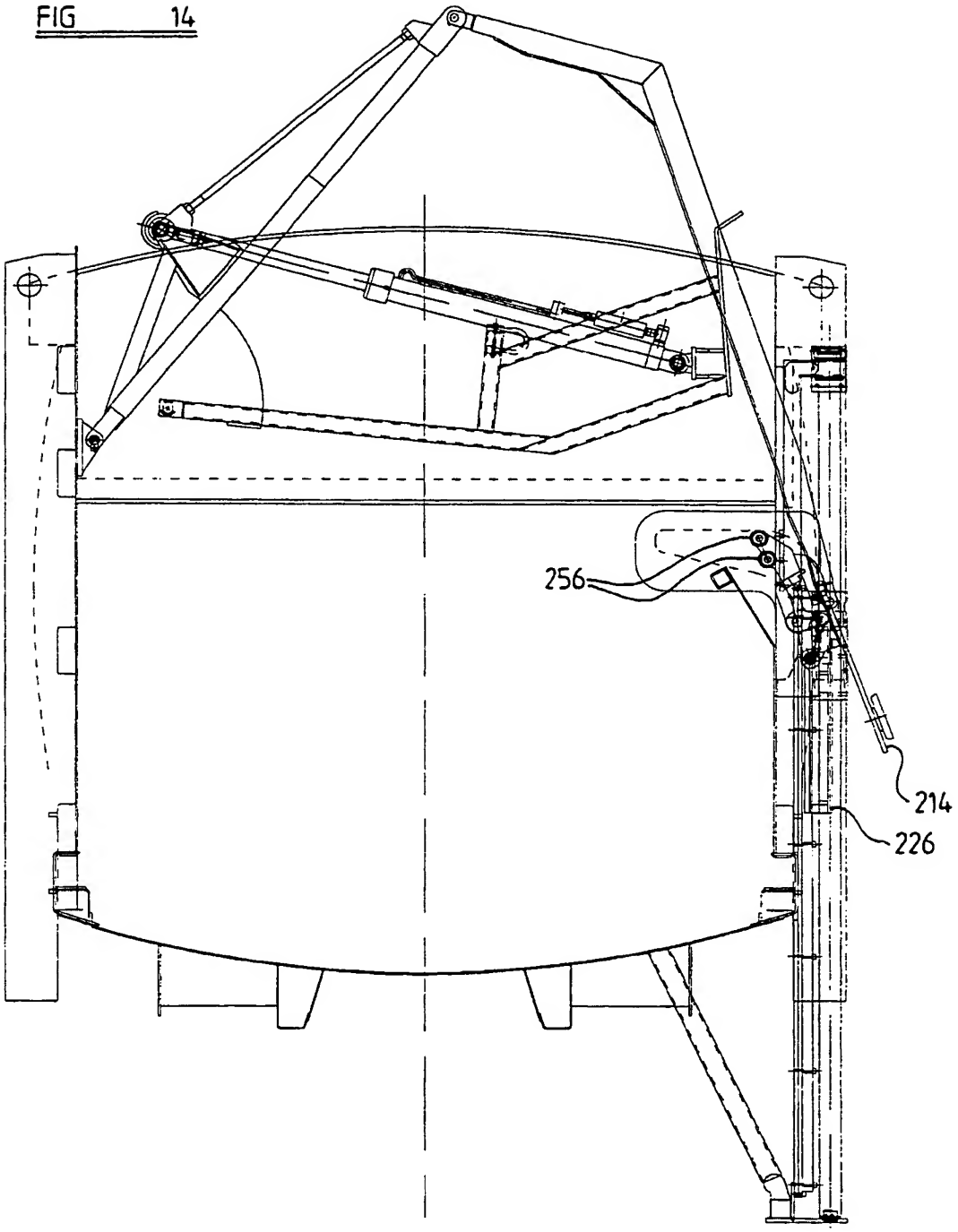
FIG 14



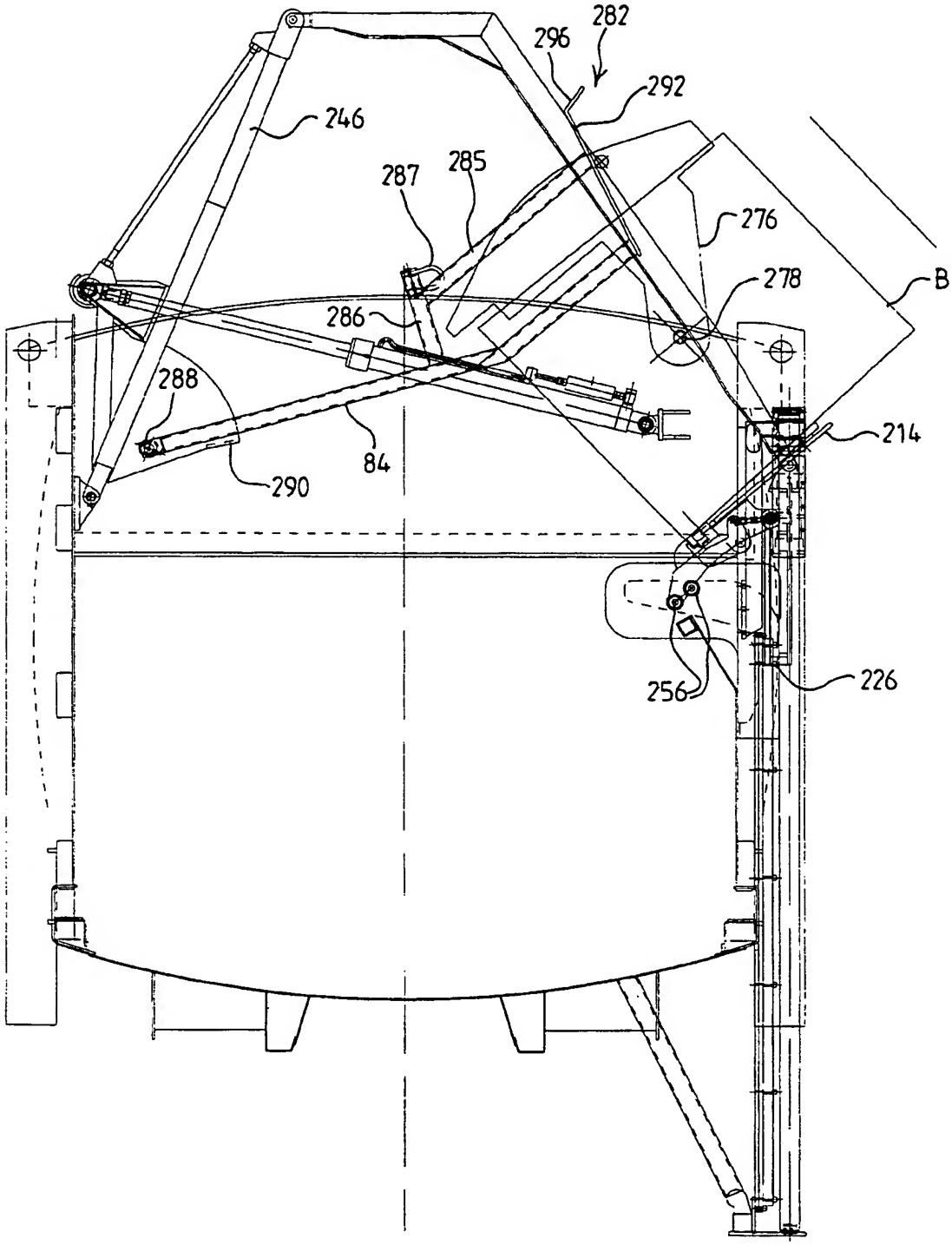


FIG 15

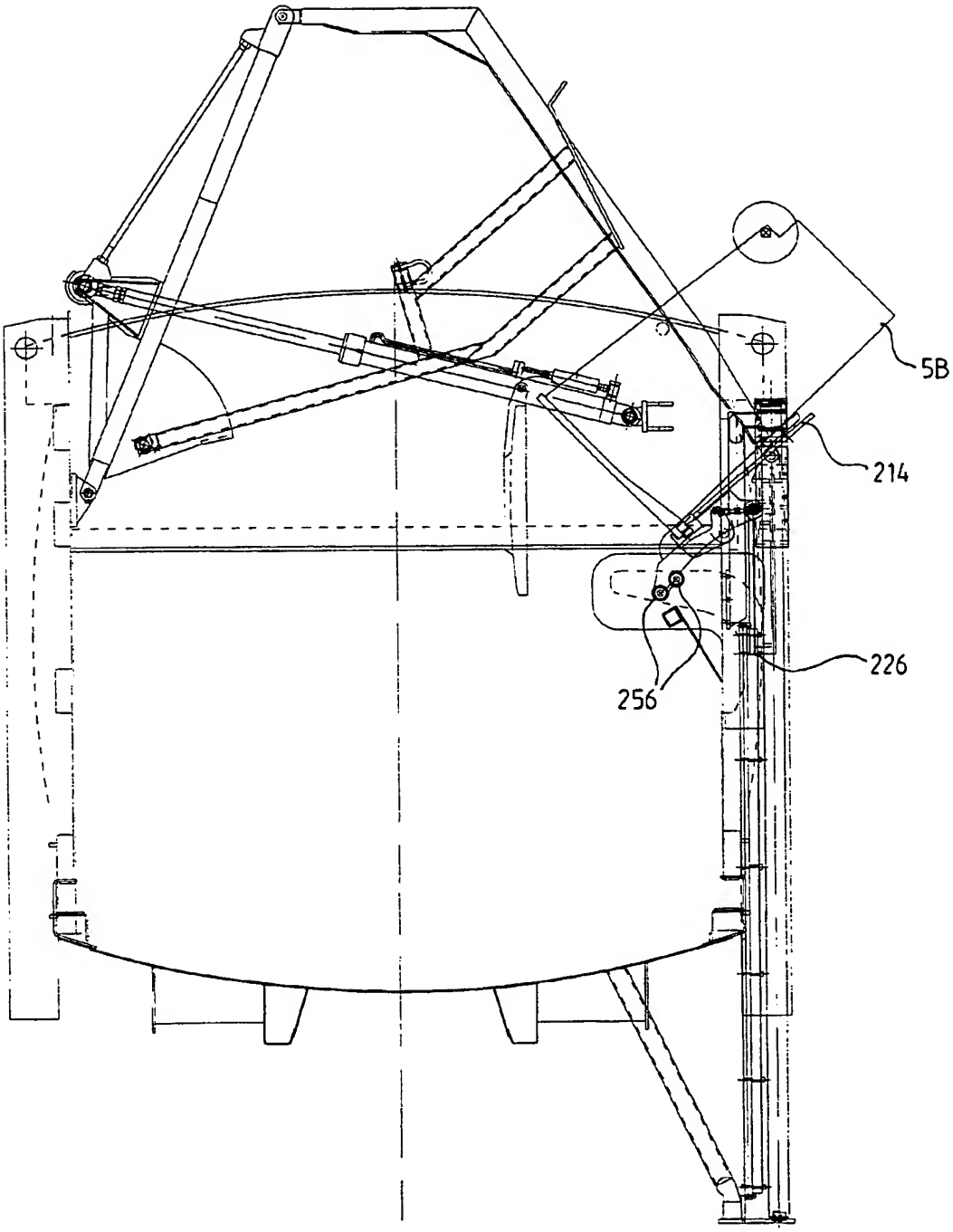


FIG 16

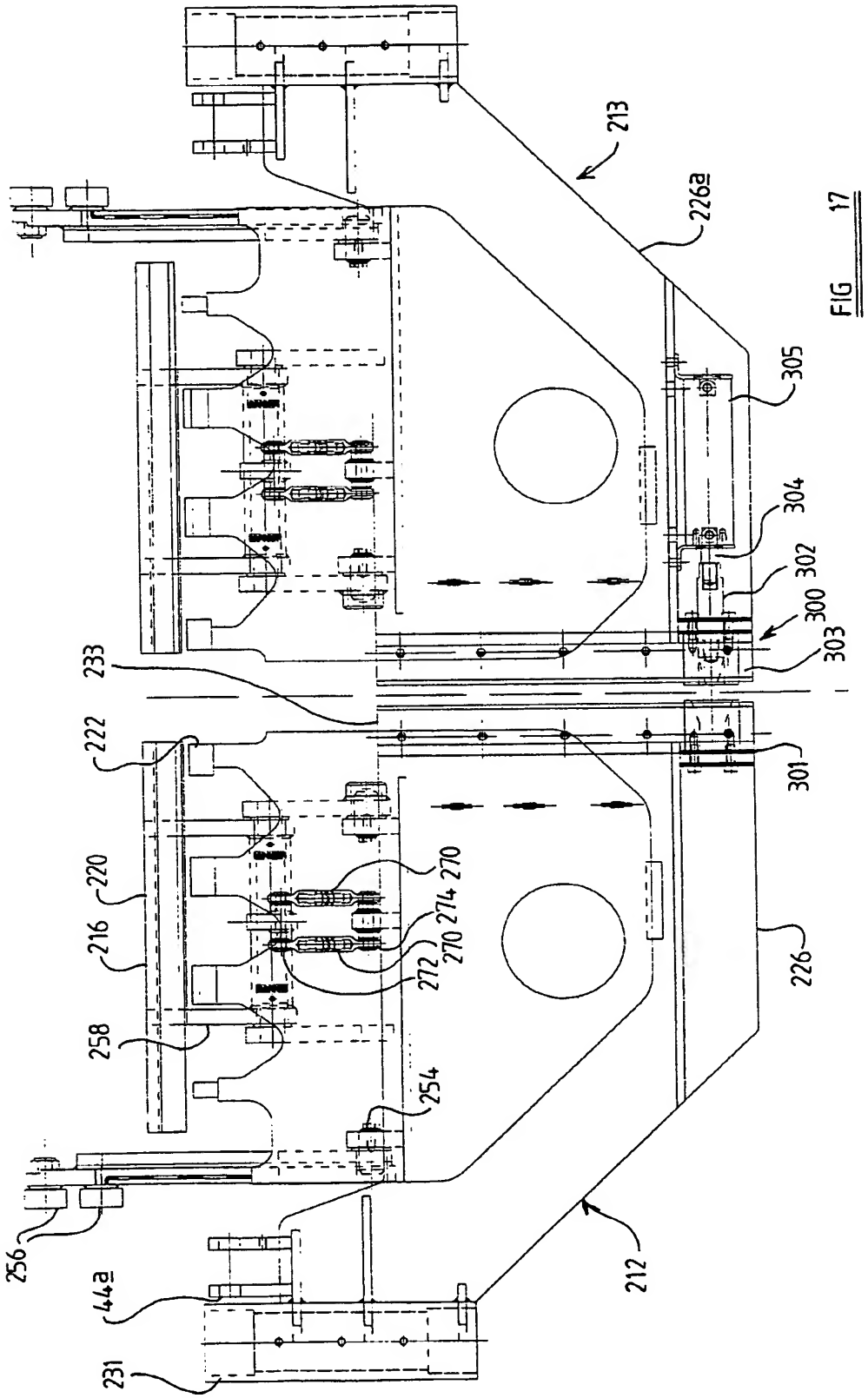

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FIG 17

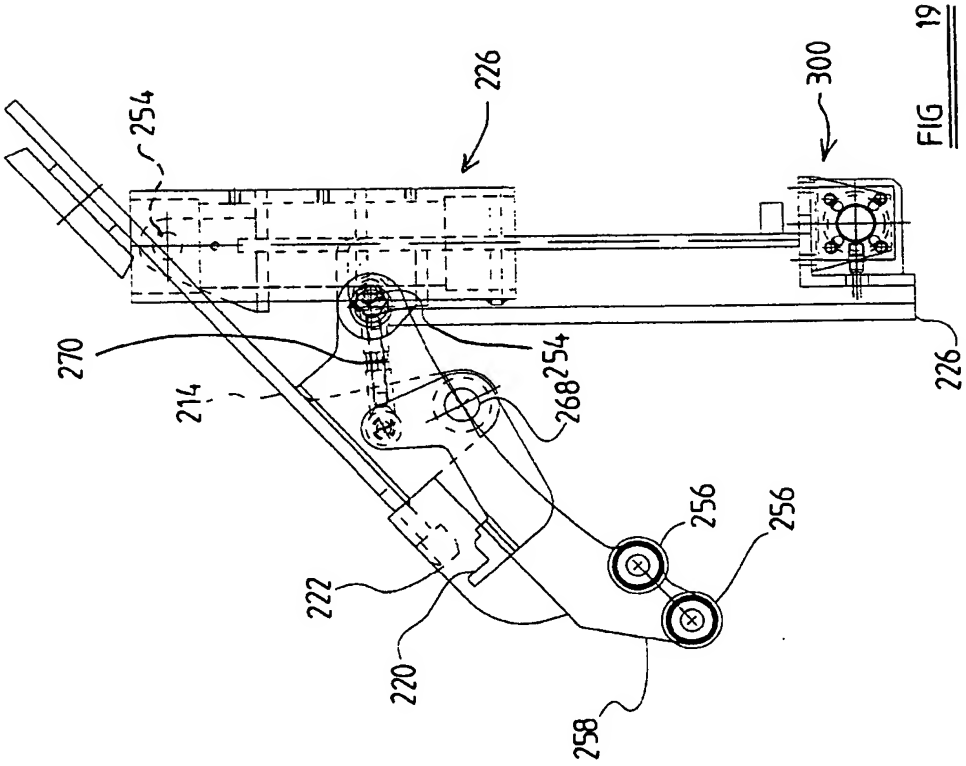
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FIG 19

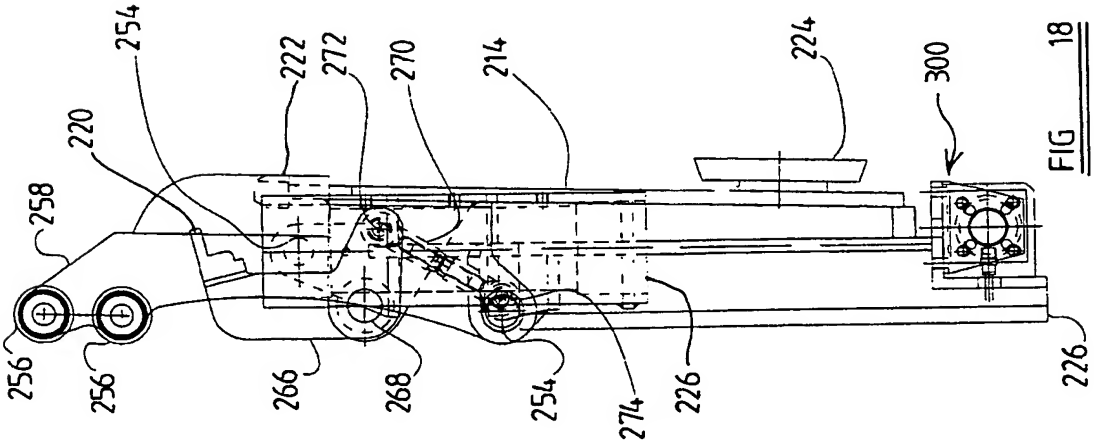
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FIG 18

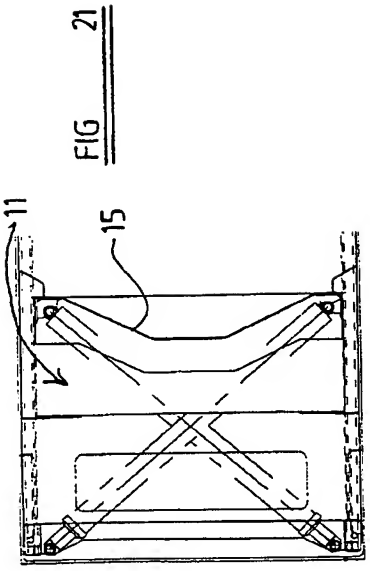

FIG 21

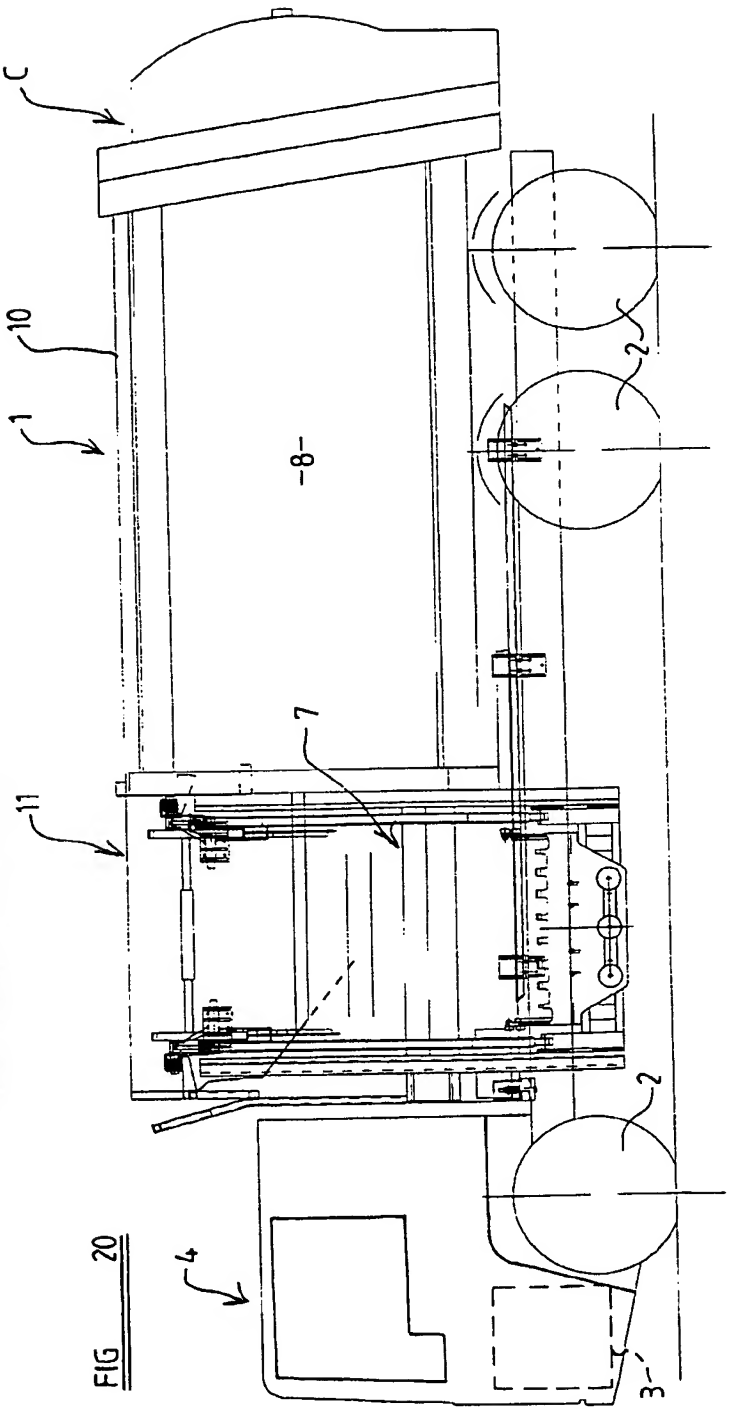

FIG 20

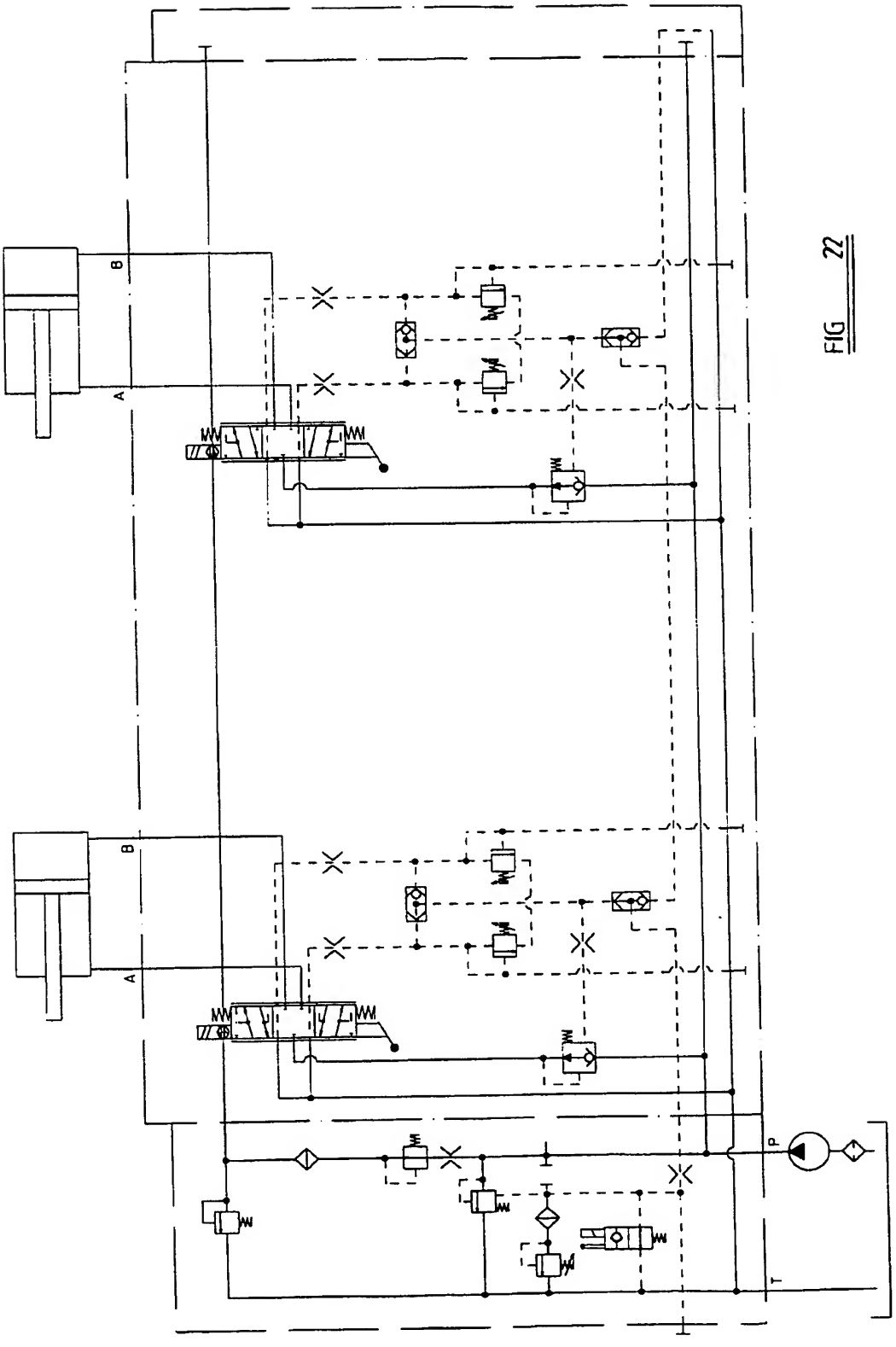

FIG 22

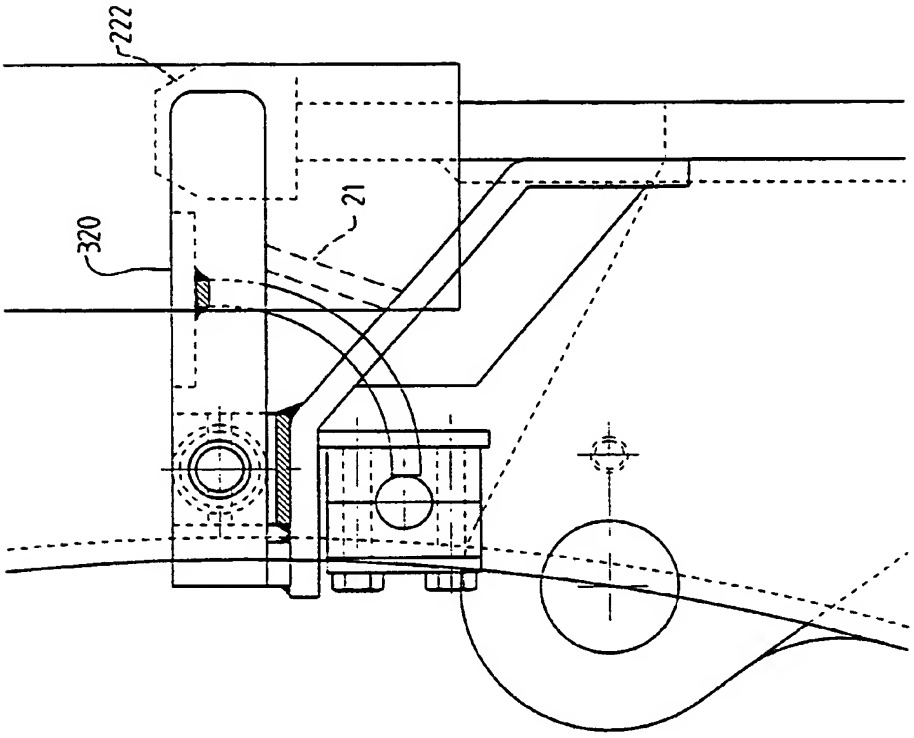

FIG 24

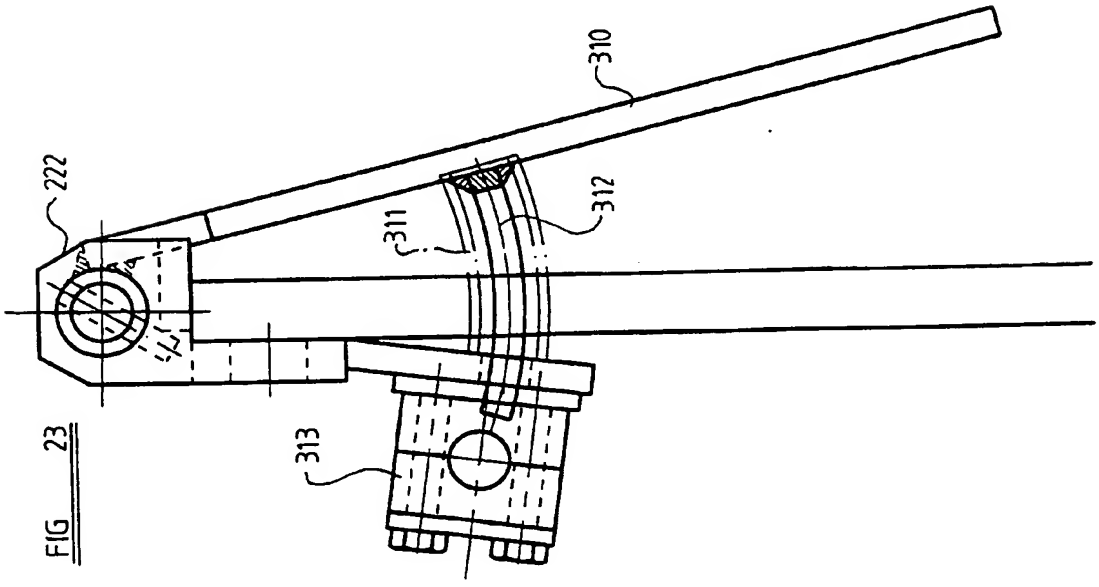

FIG 23

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 4493

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X Y	CH-A-596 087 (HADORN) * figures *	1 2,4,5	B65F3/08
Y	US-A-1 820 526 (CALDWELL) * page 1, line 96 - line 98; figure 2 *	2,4,5	
X Y	EP-A-0 463 386 (ANTONICELLI S.P.A.) * column 2, line 13 - line 48; figures 6,7 *	1,16-18 2,4,9-11	
Y	US-A-1 763 560 (AMENDOLARA) * figure 2 *	2,4,9	
Y	GB-A-2 191 461 (DAVID MACKRILL ENGINEERING LIMITED) * figure 2 *	10,11	
X	GB-A-2 168 316 (LONGARETTI) * abstract; figures 2,3 *	1	
A	CA-A-1 264 702 (BOIVIN) * figures 3,6 *	1,2,10	TECHNICAL FIELDS SEARCHED (Int.Cl.5) B65F
A	US-A-4 872 801 (YEAZEL ET AL.)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 September 1994	Martínez Navarro, A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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